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# McCLINTIC-MARSHALL CONSTRUCTION CO.

## REPORT

ON

THE CLAIM OF McCLINTIC-MARSHALL CONSTRUCTION CO.  
AGAINST THE ISTHMIAN CANAL COMMISSION, SUB-  
MITTED TO THE SENATE PURSUANT TO  
ACT OF CONGRESS OF JUNE 24, 1914

By

HON. GEORGE W. GOETHALS  
GOVERNOR OF THE PANAMA CANAL



MARCH 18, 1916.—Referred to the Committee on Appropriations  
and ordered to be printed

WASHINGTON  
GOVERNMENT PRINTING OFFICE  
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HON. GEORGE W. GOETHALS

GOVERNOR OF THE PANAMA CANAL

*Panama Canal Zone, Panama, 1916  
George W. Goethals*



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## CLAIM OF M'CLINTIC-MARSHALL CONSTRUCTION CO.<sup>1</sup>

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FEBRUARY 11, 1916.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES,  
*Washington, D. C.*

SIR: The act of June 24, 1914, provides:

That Colonel George W. Goethals, governor of the Canal Zone and formerly chairman and chief engineer of the Isthmian Canal Commission, is hereby authorized and directed to investigate the claims of the McClintic-Marshall Construction Company, a corporation of the State of Pennsylvania, having its principal office in the city of Pittsburgh, in said State, and to ascertain what amount, if any, is in justice, equity, and fairness due and owing to the said McClintic-Marshall Construction Company from the Isthmian Canal Commission for work and labor done and materials furnished in connection with the construction and erection of lock gates and appurtenances for the Panama Canal, and in connection with or incidental to the doing of the work and furnishing of the material provided for in a certain contract between the Isthmian Canal Commission and said McClintic-Marshall Construction Company dated June twenty-first, nineteen hundred and ten, taking into consideration the claim of the contractors that the work was done under requirements as to character and finish not fairly within the meaning of the specifications.

The said Colonel George W. Goethals, governor of the Canal Zone, is further authorized and empowered, either personally or through such commission as he may appoint, to investigate such claims and the various items thereof in such manner as to him may seem best, and either personally or through such commission is hereby empowered to administer oaths and affirmations to witnesses and to issue subpoenas and to compel the attendance of witnesses. He shall report in detail to the Congress of the United States his findings.

I transmit herewith the report of a commission appointed under paragraph 2 of the act of June 24, 1914, quoted above, composed of Mr. H. H. Rousseau, engineer of terminal construction of the Panama Canal, chairman; Mr. H. A. A. Smith, auditor of the Panama Canal, member; and Mr. B. F. Harrah, special counsel and examiner of claims of the Panama Canal, member.

The report upon such claims made by said commission is approved by me, and for the reasons stated in detail in said report I recommend that the sum of \$714,007.39 be paid to the McClintic-Marshall Construction Co. as the amount which "in justice, equity, and fairness is due and owing to the McClintic-Marshall Construction Co. from the Isthmian Canal Commission for work and labor done and materials furnished in connection with the construction and erection of lock gates and appurtenances for the Panama Canal, and in connection with or incidental to the doing of the work and furnishing of the material provided for in a certain contract between the Isthmian Canal Commission and the said McClintic-Marshall Construction Co., dated June twenty-first, nineteen hundred and ten, taking into consideration the claim of the contractor that the work was done under requirements as to character and finish not fairly within the meaning of the specifications."

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<sup>1</sup>All references to pages refer to original copy.



The amount which I recommend for payment is considered and recommended as a full, final, and complete settlement of all claims which the McClintic-Marshall Construction Co. has under the contract referred to in the act of June 24, 1914, quoted above, and as all that in justice, equity, and fairness is due and owing to said company and that it should be required to accept the same as such before payment to it is authorized.

The detailed report to which reference is made and which is approved by me as the report in detail and findings, which I am required by said act to transmit to the Congress, consists of the findings and conclusion of the commission appointed to investigate said claims and a report in detail in two parts, from pages 1 to 480, inclusive, on the various claims.

These findings and the "Report in detail," approved by me as a just, equitable, and fair settlement of said claims, are submitted as a full compliance with the act of June 24, 1914.

The evidence referred to in the report in detail and upon which the findings are based is on file in the office of the Panama Canal.

Respectfully submitted.

GEO. W. GOETHALS,  
*Governor the Panama Canal.*

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BALBOA HEIGHTS, *January 10, 1916.*

Maj. Gen. GEORGE W. GOETHALS,  
*Governor of the Panama Canal,*  
*Balboa Heights, Canal Zone.*

SIR: We, the undersigned committee, appointed by you to investigate the claim of the McClintic-Marshall Construction Co., under the act of June 24, 1914 (38 Stats., 388), herewith submit our report in connection with such investigation.

Our report will be submitted under the following general headings:

1. Reference to and quotation of the law authorizing the investigation.

2. Reference to claim presented by McClintic-Marshall Construction Co. and statement of the claims made.

3. Appointment of the committee and quotation of a letter making the appointment; also quotation of a letter showing the change in the status of B. F. Harrah.

4. History of the claim and how it originated. (Under this heading a reference will be made to the original circular, various modifications therein, the original contract, and the various modifications in the original contract.)

5. Statement of the work that has been done, giving a reference to the testimony that has been taken and the data that has been accumulated in connection with the investigation.

6. A statement of the general principles which the committee has applied in the investigation of the claims made.

7. Findings of fact and conclusions of law, and recommendation as to the action to be taken upon each claim by the contractor.

8. General conclusion.

1. REFERENCE TO AND QUOTATION OF THE LAW AUTHORIZING THE INVESTIGATION.

The act of June 24, 1914, page 388, provides:

That Colonel George W. Goethals, governor of the Canal Zone, and formerly chairman and chief engineer of the Isthmian Canal Commission, is hereby authorized and directed to investigate the claims of the McClintic-Marshall Construction Company, a corporation of the State of Pennsylvania, having its principal office in the city of Pittsburgh, in said State, and to ascertain what amount, if any, is in justice, equity, and fairness due and owing to the said McClintic-Marshall Construction Company from the Isthmian Canal Commission for work and labor done and materials furnished in connection with the construction and erection of lock gates and appurtenances for the Panama Canal, and in connection with or incidental to the doing of the work and furnishing of the materials provided for in a certain contract between the Isthmian Canal Commission and said McClintic-Marshall Construction Company, dated June twenty-first, nineteen hundred and ten, taking into consideration the claim of the contractors that the work was done under requirements as to character and finish not fairly within the meaning of the specifications.

The said Colonel George W. Goethals, governor of the Canal Zone, is further authorized and empowered, either personally or through such commission as he may appoint, to investigate such claims and the various items thereof in such manner as to him may seem best, and either personally or through such commission is hereby empowered to administer oaths and affirmations to witnesses, and to issue subpoenas and to compel the attendance of witnesses. He shall report in detail to the Congress of the United States his findings.

Approved, June 24, 1914.

2. REFERENCE TO CLAIM PRESENTED BY M'CLINTIC-MARSHALL CONSTRUCTION CO., AND STATEMENT OF THE CLAIMS MADE.

October 14, 1914, the McClintic-Marshall Construction Co. submitted its claim in printed form, being 86 pages of printed matter, for the opening part of the claims, with an appendix of 38 pages, prepared by Paul L. Wolfel, chief engineer, claimant.

On page 67 of this claim the various items are stated:

*Amount of claims.*

1. Extra cost of working drawings, due to delay in furnishing complete designs and data, to changes made, and to delay in the approval of working drawings-----	\$8, 890. 00
2. Increased cost of fabrication due to delay in furnishing the contractor the necessary data, unfair demands of the commission's engineers, and unreasonable shop inspection-----	320, 892. 00
3. Material rejected or put in stock on account of unreasonable inspection -----	46, 735. 00
4. Extra cost of water stops, soaked in red lead and linseed oil, put in place-----	21, 999. 75
5. Loss on shop output, due to delays, unfair demands of the commission's engineers, and unreasonable inspection-----	123, 660. 00
6. Extra cost of erection due to conditions imposed upon the contractor contrary to the contract requirements, also to conditions that caused extra expense, which should be borne by the commission, to unreasonable inspection in the field, and to the necessity of completing the work within the time demanded in spite of numerous delays caused by the commission, and the extra work necessary on account of the conditions mentioned above and unreasonable inspection -----	1, 325, 091. 00
7. Extra cost of erection outfit required to complete the work within the time demanded-----	200, 000. 00
Total-----	2, 047, 267. 75



July 12, 1915, the claimants revised their claim, as follows:

*Amount of claims.*

1. Extra cost of working drawings, due to delay in furnishing complete designs and data, to changes made, and to delay in the approval of working drawings-----	\$8, 890. 00
2. Increased cost of fabrication due to delay in furnishing the Contractor the necessary data, unfair demands of the Commission's engineers, and unreasonable shop inspection-----	320, 892. 00
3. Material rejected or put in stock on account of unreasonable inspection-----	48, 621. 00
4. Extra cost of water stops, soaked in red lead and linseed oil, put in place-----	21, 999. 75
5. Loss on shop output, due to delays, unfair demands of the Commission's engineers, and unreasonable inspection-----	123, 660. 00
6. Extra cost of erection due to conditions imposed upon the Contractor contrary to the contract requirements, also to conditions that caused extra expense which should be borne by the Commission, to unreasonable inspection in the field, and to the necessity of completing the work within the time demanded in spite of numerous delays caused by the Commission and the extra work necessary on account of the conditions mentioned above and unreasonable inspection---	1, 218, 475. 00
7. Extra cost of erection outfit required to complete the work within the time demanded-----	200, 000. 00
Total-----	1, 942, 537. 75

At the bottom of page 86 of the printed claim the following note appears:

N. B.—Additional claim covering interest charges on account of deferred payments will be presented in detail as soon as it can be compiled.

Under date of July 29, 1915, a claim for interest was submitted, as follows:

Interest on invoices rendered per statement attached-----	\$564, 075. 53
Less interest on cash payments per statement attached-----	540, 185. 50
Total-----	23, 891. 03
Interest on balance of \$31,463.78 from July 31, 1914, to Dec. 7, 1914-----	676. 48
Interest on balance of \$29,620.41 from Dec. 7, 1914, to Dec. 12, 1914-----	24. 68
Interest on balance of \$14,704.61 from Dec. 12, 1914, to Dec. 14, 1914-----	4. 90
Total-----	24, 597. 09

3. APPOINTMENT OF THE COMMITTEE AND QUOTATION OF A LETTER MAKING THE APPOINTMENT—ALSO QUOTATION OF A LETTER SHOWING THE CHANGE IN THE STATUS OF B. F. HARRAH.

On December 14, 1914, you appointed a committee and gave instructions, as follows:

BALBOA HEIGHTS, *December 14, 1914.*

Mr. H. H. ROUSSEAU,  
*Engineer of Terminal Construction.*

Mr. H. A. A. SMITH,  
*Auditor, Panama Canal.*

Mr. B. F. HARRAH,  
*Assistant Auditor, Washington, D. C.*

SIRS: Under the provisions of the act of June 24, 1914, you are appointed a commission to investigate the claims of the McClintic-Marshall Construction Co.



arising out of the construction and erection of the lock gates and appurtenances for the Panama Canal, under the contract of June 29, 1910.

I desire that a full and complete investigation be made by you of all matters connected with the claims of the contractor, special attention being given to the allegations that the work was done under requirements as to character and finish not fairly within the meaning of the specifications, and also to the amount of expenses incurred by the contractor in carrying out the contract and the losses, if any, that were sustained.

The two members of the commission on the Isthmus will meet and determine upon the general plan of procedure to be followed in the conduct of the investigation. Each member of the commission is authorized to act for it in securing evidence, in administering oaths and affirmations to witnesses, in issuing subpoenas, and in compelling the attendance of witnesses. Mr. W. M. Sterrett is now on the Isthmus, and the investigation should be commenced here as early as practicable. It should also be carried on in the States at the same time.

The commission will issue instructions to Judge Harrah in regard to the examination of the books and records of the company in the United States for the purpose of ascertaining the amount expended by the company in carrying out the contract and for the purpose of obtaining evidence necessary for a complete investigation of the claims of the Contractor. Such witnesses will be heard in the States as are necessary to complete the investigation.

Upon completion of the investigation you will submit your report and recommendations as to the amount, if any, that should in justice, equity, and fairness be paid to the said McClintic-Marshall Construction Co. on account of its claims under the lock-gate contract.

Respectfully,

GEO. W. GOETHALS, *Governor*.

On May 13, 1915, B. F. Harrah, special counsel and examiner of claims of the Panama Canal, was appointed a member of the commission to continue the examination that he was making as assistant auditor of the Panama Canal. His appointment and authority conferred under the terms of the act of June 24, 1914, is as follows:

WASHINGTON, D. C., *May 13, 1915.*

B. F. Harrah, special counsel and examiner of claims of the Panama Canal, is hereby appointed a member of the commission to examine the claim of the McClintic-Marshall Construction Co. under the act of June 24, 1914, to take the place of B. F. Harrah, assistant auditor of the Panama Canal, temporarily relieved from duty as assistant auditor, and shall have power to subpoena witnesses, compel their attendance, administer oaths, and call for papers, and take all other necessary actions to thoroughly investigate said claim as provided for in the act of June 24, 1914, including authority to incur and approve the necessary expenses in connection with the investigation and report on said claim.

This appointment is made to continue the investigation heretofore begun by B. F. Harrah, assistant auditor and member of the commission, and is subject to the same limitation that was imposed upon the assistant auditor as a member of the commission.

GEO. W. GOETHALS, *Governor*.

#### 4. HISTORY OF THE CLAIM AND HOW IT ORIGINATED.

(Under this heading a reference will be made to the original circular, various modifications therein, the original contract, and the various modifications in the original contract.)

The claim originated under the contract which was let to McClintic-Marshall Construction Co. in response to its proposal under circular invitation No. 576, issued by the Isthmian Canal Commission April 16, 1910, calling for proposals to furnish and erect 46 miterring lock gates of two leaves each, and certain fixed parts for the same, and for furnishing and delivering certain repair parts.

This circular was to be opened June 15, 1910.

It was modified by mimeograph notice of May 4, 1910, by providing that the masonry at Gatun Locks should be ready October 1, 1910, instead of October 1, 1911.

It was further modified by mimeograph notice of May 6, 1910, by providing that the lower and middle gates, intermediate locks Gatun, eight leaves in all, should be increased 10 inches in height by changing the height, panel 9, from 4 feet 2 inches to 5 feet.

It was further modified June 9, 1910, by providing that the contractor would be relieved from responsibility for damages caused by earthquakes and floods and damages due to defects in the foundations erected by the commission.

One of the statements contained in the invitation and which the contractor claims described the character of the work to be expected under the circular was as follows:

In making the award no bidders will be considered who are not manufacturers of high-grade structural bridge or ship work of such character as is required in the specifications or whose facilities for furnishing the material in the time specified and of the quality required, which will be in the opinion of the commission sufficient for the purpose.

Four bids were received under this circular, as follows:

McClintic-Marshall Construction Co -----	\$5, 374, 474. 82
United States Steel Products Export Co-----	6, 103, 041. 10
Maryland Steel Co -----	8, 409, 369. 31
Riter-Conley Manufacturing Co-----	10, 183, 257. 00

The original estimate for the work under this contract was \$6,500,000. It will be noted, therefore, that two of the bidders were below the original estimate.

After the bids were received, the facilities of the McClintic-Marshall Construction Co. to perform the contract were investigated. This investigation satisfied the general purchasing officer of the Panama Canal that the McClintic-Marshall Co. were equipped so that they could perform this contract. The award was made to them June 21, 1910, in accordance with their proposal. A contract dated June 21, 1910, was subsequently entered into with McClintic-Marshall Construction Co. A copy of this contract is attached hereto and made a part of this report, together with a copy of circular 576.

Before the contract was signed, certain corrections were made in the specifications printed in Circular 576 and inserted in the contract as "Table of corrections," page 4. This table of corrections is as follows:

Lower and middle gates, intermediate lock, Gatun, eight leaves in all; height of leaf is hereby increased 10 inches by changing height of panel No. 9 from 4 feet 2 inches to 5 feet. Girders 9 and 10 will have two upstream cover plates of same widths as shown for lower girders. All other parts of gate remain unchanged except height of this one panel.

Page 4 of specifications, group B, item 6: Omit the words "except those included in items 9 and 10."

Page 8, seventeenth line from top: "July 1, 1910," substituted in place of "June 1, 1910."

Page 8, in column "Masonry ready," opposite first group of gates, Gatun locks, date changed to read "October 1, 1910," instead of "October 1, 1911."

Page 12, section 29, last sentence: The keying of the bushing to the pintle casting is not shown on the plans, but the bushing must be keyed to the casting without extra charge, if the contractor is so directed.

Section 32, next to last line: "Section 95" should read "Section 96."

Section 33. This entire section shall read as follows: "This shall be made of a nickel-steel forging, with bolts of bronze, all made as shown on drawing



No. 5042. The pin shall be finished smooth with clearance as shown; it shall be securely keyed to a structural seat on the top of the leaf."

Page 13, section 42, stiffener angles: As here stated, all stiffener angles shall be crimped over flange angles, except where there are reinforcing plates on webs. On certain of the drawings fillers are shown, even where there are no reinforcing plates, but this is incorrect. The provision of the specification is to be followed in this regard.

Page 17, section 71, lines 3 and 4: In place of "elongation in 8 inches," read "percentage of elongation in 8 inches."

Page 18, section 81, line 3: In place of "elongation in 8 inches," read "percentage of elongation in 8 inches."

Page 19, section 87, line 16: In place of "minimum elongation," read "minimum percentage of elongation."

Page 20, last two lines should read: "They must be capable of sustaining a pressure of 35 pounds per square inch on the cover."

Page 22, section 112, line 2: Change "upper girder" to "bottom girder."

Page 24, section 121, line 7: "The end plate shall be planed to a smooth surface." This refers to the plate 24 inches wide at the extreme end of structural work. The outer surface of this plate is to be finished so that it shall form an exact plane for the entire height of the leaf. The original thickness of the plate provided must be sufficient to allow this planing without reducing final thickness of the plate below three-fourths of an inch.

Page 27, section 3, tenth line: "June 1, 1910," should read "July 1, 1910."

On August 8, 1910, an agreement embodying certain modifications in the specifications was agreed to between Mr. Goldmark, representing the Isthmian Canal Commission, and Mr. Paul L. Wolfel, representing the Contractor. These are numbered consecutively from 1 to 36, and are printed in back part of the claim.

In connection with these changes Mr. Goldmark wrote Mr. Paul L. Wolfel, chief engineer of the McClintic-Marshall Construction Co., as follows:

PITTSBURGH, PA., *August 8, 1910.*

During the past weeks I have gone over with you the plans and specifications, with a view to the speedy preparation of the shop drawings, and also for obtaining material required for the construction of the gates with the least possible delay. With this object in view, we have agreed upon a number of minor modifications and additions to the Contractor's drawings and certain provisions in the specifications. These modifications are included in a blue-print memorandum attached to this letter, dated August 2 and August 8, which also covers certain points taken up with the Jones & Laughlin Steel Co., and the Wheeling Mold & Foundry Co., dated August 4 and August 6.

While these memoranda include all changes which have been agreed to, to date, there will undoubtedly be further minor modifications and questions of detail to be settled with Mr. J. Hammer, assistant engineer, Isthmian Canal Commission, who remains in charge of this office.

I understand that while these changes will, to some extent, vary the weights of the several items there is to be no change in any of the unit prices contained in the contract.

Kindly acknowledge receipt of this letter, and your understanding of its purport, particularly reference to the last clause.

On August 12, 1910, Mr. Paul L. Wolfel wrote Mr. Goldmark, as follows:

We beg to acknowledge receipt of your letter of August 8, and the attached blue prints covering a number of minor modifications and additions of the contractor's drawings for the Isthmian Canal gates, also certain provisions in connection with the specifications. The blue-print memorandum attached to your letter dated August 8 covers the work to be fabricated at Rankin. August 2 covers the work to be done at Jones & Laughlin mills, and August 4 and 6 covers the work to be done by the Wheeling Mold & Foundry Co. We find these blue prints correct and in accordance with our understanding and will proceed in accordance with the same, with the understanding that there will be no changes in any of the unit prices provided for in the contract.

We also note that for further changes and matters of detail we will have to deal with Mr. J. Hammer, assistant engineer, Isthmian Canal Commission, who remains in charge of your office at our works.

Other supplemental contracts affecting this work were made as follows:

June 15, 1911, a supplemental contract was entered into changing the terms of payment and providing for certain changes in the valve openings on the 66-foot and 47-foot leaves, providing that sand blasting of certain members should be omitted and they should be cleaned by other means, the plates to be cleaned by a pickling process or a substitute therefor. This contract also provided that—

It has been found necessary to substitute 11 by 15 inch manholes for the 10-inch diameter vents in each end of the girder in air chamber, and to substitute 11 by 15 inch manhole covers for 10-inch air-vent covers at these openings in end of top girder of air chambers.

It also provided that the—

Contractor hereby agrees to make these modifications on the understanding that the individual parts as supplied shall be paid for at the same price per pound named in the original contract under W. O. 23444 for the several classes of material, subject to the limits of overweight therein set forth, and the Contractor agrees to make no claims for reduction in amount to be paid for girders through reduction in weight on account of increase in size of holes cut from same or for added cost arising from any extra work involved, increase in number of rivets to be driven as a result of this modification, in consideration of the concession by the Commission affecting the insurance requirements as set forth in Article V.

Article V states the requirements relative to insurance under the original contract.

December 16, 1911, W. O. 23444-A, providing for the completion of the entire interior surface of the lock gates with American bitumastic enamel instead of American bitumastic solution, as provided for in the contract, and providing for additional payment therefor.

February 7, 1912, guaranty contract of the American Bitumastic Enamels Co. (W. O. 23444-A), guaranteeing the bitumastic enamel for a period of five years.

June 13, 1912, W. O. 23444-B, providing for the substitution of vanadium steel for bronze bushings in upper pintle castings and an increase in payment therefor.

January 14, 1913, W. O. 23444 (supplemental), providing for changes in payment.

May 20, 1913, W. O. 23444 (supplemental), providing for new dates for the completion of the various gates.

The contract was completed by the dates specified in the last supplemental agreement.

On March 6, 1914, as appears in a statement before the Subcommittee on Appropriations, United States Senate, Sixty-third Congress, second session, on House bill 13612, the contractor wrote a letter to Senator Oliver, of Pennsylvania, in which a claim was made for \$2,394,488.

The act above quoted was passed for the investigation of this claim.



5. STATEMENT OF THE WORK THAT HAS BEEN DONE, GIVING A REFERENCE TO THE TESTIMONY THAT HAS BEEN TAKEN AND THE DATA THAT HAS BEEN ACCUMULATED IN CONNECTION WITH THE INVESTIGATION.

Mr. Goldmark was employed to examine the files and refresh his memory, and to prepare a report on all the general features of this claim.

The result of his work is found in General Exhibit No. 1, volume reference 1.

Mr. Price was also employed to search the files, and he has made an exhaustive search of the files in the Washington office and the inspection files of Assistant Engineer J. Hammer.

He has made a report in detail as to the character and method of the shop inspection and the manner in which the material was fabricated at the shops. Mr. Price's report is General Exhibit No. 3.

The files of the Isthmian Canal Commission have been searched, and such letters as bear upon the claim have been copied from the files of the Isthmian Canal Commission, W. O. 23444. The copies of these letters are found in General Exhibit No. 4, submitted herewith.

The testimony of a large number of witnesses has been taken; a list of these witnesses is transmitted herewith.

A partial running index of the testimony of the various witnesses is transmitted herewith.

The books of the McClintic-Marshall Construction Co. have been examined, and the result of this examination will be found in Exhibit No. 27, volume 27, of the evidence, headed "Data compiled at Rankin, Pa., April 11, 1915, to May 1, 1915."

The Contractor has furnished a statement of the total shop cost and an analysis of expenses in the United States and on the Isthmus. This evidence will be found in General Exhibit No. 26, volume 26, of the evidence.

6. A STATEMENT OF THE GENERAL PRINCIPLES WHICH THE COMMITTEE HAVE APPLIED IN THE INVESTIGATION OF THE CLAIMS MADE.

The manner in which the claim was submitted made it necessary for the committee to investigate the various contentions of the claimant and in applying the evidence to resolve the unknown quantities by the weight of the probabilities.

In most instances it has been found impossible to obtain such evidence as would enable the committee to reduce the claims to anything more than a reasonable estimate.

It does not seem from the act of Congress that Congress intended to relieve the Contractor from his obligations under the contract, and the committee has proceeded upon the theory that the Contractor was bound to perform his contract and do all things that could be required of him under a reasonable and fair interpretation of the terms of the contract for the compensation named in the contract. It would not seem to be just, equitable, or fair to relieve the Contractor from his contract obligations. Congress seems to have indicated that this should be the scope of the investigation when it said "taking into consideration the claim of the Contractor that the work was done under requirements as to character and finish not fairly

within the meaning of the specifications." These words seem to have been inserted to determine the character and scope of the investigation authorized.

In the investigation the Contractor has been permitted to submit evidence upon every feature of the claim, and in applying that evidence your committee has endeavored to exclude such of the evidence submitted as does not appear to be within the scope and purpose of the act of Congress, and to consider only such as comes fairly within the language of the act conferring the authority upon you.

The claims are each considered separately and a recommendation is made upon each individual claim. It is not believed, however, by the committee that Congress intended that the Contractor should be stopped, by reason of any contract provisions which might otherwise prohibit its consideration as a legal claim from asserting any equitable or just claim which it might have under a fair interpretation of the contract provisions. In other words, if, under a fair and reasonable interpretation of the contract and the facts as they have been developed, it would seem that in justice, equity, and fairness, an allowance should be made to the Contractor, such allowance is recommended.

Claims have only been considered as *res adjudicata* in cases where they have been taken up and fully considered and contracts entered into supplemental to the original contract settling the particular claims and contentions covered by the supplemental contract.

There seems to be many causes of complaint on the part of the Contractor that were not taken up and settled or passed upon in the form of any supplemental agreement. These contentions are considered in connection with each individual claim.

Your committee has prepared a detailed report containing a brief of the evidence, statement of facts, conclusions, comments, and action recommended on each claim, which will be hereinafter referred to as "Report in detail on claims."

#### 7. FINDINGS OF FACT AND CONCLUSIONS OF LAW AND RECOMMENDATION AS TO THE ACTION TO BE TAKEN UPON EACH CLAIM BY THE CONTRACTOR.

##### *Claim No. 1.*

Extra cost of working drawings, due to delay in furnishing complete designs and data, to changes made and to delay in the approval of working drawings----- \$8,890

(See pp. 67 and 68, book of claims.)

There was delay in furnishing the necessary data and completing the designs for the working drawings.

There were changes which increased the cost of the drawings.

There were delays in the approval of the working drawings which increased the cost of these drawings.

The parts of these increased expenses which your committee finds were occasioned by the fault of the Isthmian Canal Commission are as follows:

Lost time at the start-----	\$350
Delays on account of information-----	600
Change in pump chamber-----	625
Change in gauges-----	510



Changes in air vent-----	\$210
Change in manhole frames -----	120
Change in mitering mechanism-----	105
Addition of bent angles top of air chamber-----	30
Change in sheathing plates-----	805
Man loaned to Mr. Hammer-----	180
Change in cast-iron curbs-----	45
Experimenting with manhole covers-----	100
Delay in approving drawings-----	600
Extra work on spare parts-----	550
Man in Mr. Hammer's office-----	750
Total-----	5,580

It is recommended that this amount be paid to the Contractor under claim No. 1. (See "Report in detail on claims," pp. 1 to 15, inclusive.)

*Claim No. 2.*

Increased cost of fabrication due to delay in furnishing the Contractor the necessary data, unfair demands of the Commission's engineers, and unreasonable shop inspection----- \$320,892

This claim is based upon the theory that the shop labor and surcharge on the lock gates was over \$4 per ton higher than the average cost of all work turned out of shop 2 for the year preceding and the year succeeding the fabrication of the lock-gate material, and on the further contention that the lock-gate material should have been fabricated at about \$2 per ton less than the average cost of all work passing through shop 2 for the year preceding and the year succeeding the fabrication of the lock-gate material.

The lock-gate material did cost \$4 per ton more to fabricate than all work turned out of the same shop for the year preceding and the year succeeding the fabrication of the lock-gate material. The lock-gate material should have cost more than all other material fabricated in shop 2 for the year preceding and the year succeeding the fabrication of the lock-gate material.

The facts do not support the contention of the contractor that it should have cost less to fabricate the lock-gate material than all other material passing through shop No. 2 for the year preceding and the year succeeding the fabrication of the lock-gate material.

The lock-gate material did cost more to fabricate in shop 2 than it should have cost the contractor, owing to the excessive demands made by the Isthmian Canal Commission's engineers and inspectors and to the changes that were made in the specifications.

The amount of such increased cost under claim 2, due to changes and excessive demands of the engineers and inspectors, for which the Isthmian Canal Commission should be held responsible in equity, fairness, and justice, is \$77,264.64. It is recommended that this sum be paid to the Contractor. (See "Report in detail on claims," pp. 16 to 215, inclusive.)

*Claim No. 3.*

Material rejected or put in stock on account of unreasonable inspection\_ \$48,621  
(See p. 67, book of claims.)

Material was rejected and put in stock on account of unreasonable inspection.

The amount of material rejected for these and other causes for which the Isthmian Canal Commission should be held responsible, is 600,000 pounds.



The amount to be paid for this material is fixed at \$35 per ton.

The amount recommended to be paid on this claim is \$10,500. (See "Report in detail on claims," pp. 216 to 247, inclusive.)

*Claim No. 4.*

Extra cost of water stops, soaked in red lead and linseed oil, put in place ----- \$21,094.75  
(See pp. 67, 69, 70, book of claims.)

Water stops were not required under the original specifications.

The use of water stops was necessary to make the work water-tight.

The extra cost in connection with their use is found to be reasonable. It is recommended that the amount of this claim as revised—\$21,094.75—be paid to the contractor. (See "Report in detail on claims," pp. 247–248, inclusive.)

*Claim No. 5.*

Loss on shop output due to delays, unfair demands of the commission's engineers, and unreasonable inspection ----- \$123,660  
(See pp. 67, 70, book of claims.)

The loss of output in shop 2 for which the Isthmian Canal Commission is considered responsible was 4,702 tons.

The profit that the contractor might reasonably have expected to make from this output was \$5 per ton.

It is recommended that \$23,510 be allowed on this claim. (See "Report in detail on claims," pp. 248, 249, also 215.)

*Claim No. 6.*

Extra cost of erection due to conditions imposed upon the contractor contrary to the contract requirements, also to conditions that caused extra expense which should be borne by the commission, to unreasonable inspection in the field, and to the necessity of completing the work within the time demanded in spite of numerous delays caused by the commission, and the extra work necessary on account of the conditions mentioned above and unreasonable inspection ----- \$1,218,475  
(See p. 67, book of claims.)

The contractor did incur extra expense in connection with the erection of the lock gates due to conditions imposed upon him in excess of the contract requirements.

Applying the method of arriving at such excess as adopted by the contractor in his claim from pages 73 to 85, inclusive, to the evidence, your committee finds that the excess for which the Isthmian Canal Commission was responsible amounts to \$499,098.

It is recommended that this sum be paid to the contractor under claim 6. (See "Report in detail on claims," pp. 253–470, inclusive.)

*Claim 7.*

Extra cost of erection outfit required to complete the work within the time demanded ----- \$200,000  
(See p. 67, book of claims.)

The contractor claims that the total cost of equipment and tools for the work, less the salvage, was about \$400,000. He claims that one-half of this excess cost is chargeable to the commission.

The action of the Isthmian Canal Commission did cause the contractor to purchase extra equipment in order to complete the work under the requirements as to character and finish imposed and by the time specified in the supplemental contract.

The value of this excess equipment for which the Isthmian Canal Commission is found to be responsible is \$75,000.

It is recommended that the contractor be paid \$75,000 on claim 7. (See "Report in detail on claims," pp. 471-474, inclusive.)

The contractor claims \$1,960 for the use of a crane (No. 18) which was wrecked by a gravel train operated by the Isthmian Canal Commission.

The commission repaired this crane at the Gorgona shops and the contractor lost the use of it for 98 days. The amount is considered reasonable, and it is recommended that it be paid. (See "Report in detail on claims," pp. 475, 477.)

#### S. GENERAL CONCLUSIONS.

It is the conclusion of your committee that the amount which should in equity, justness, and fairness be paid to the McClintic Marshall Construction Co. upon the claim which you were authorized and directed to investigate by the act of June 24, 1914, is \$714,007.39. (See "Report in detail on claims," p. 480.)

It is recommended by your committee that the sum of \$714,007.39 be reported to Congress under act of June 24, 1914, as the amount which, "in justice, equity, and fairness, is due and owing to the McClintic Marshall Construction Company from the Isthmian Canal Commission for work and labor done and materials furnished in connection with the construction and erection of lock gates and appurtenances for the Panama Canal, and in connection with or incidental to the doing of the work and furnishing of the material provided for in a certain contract between the Isthmian Canal Commission and the said McClintic Marshall Construction Company, dated June twenty-first, nineteen hundred and ten, taking into consideration the claim of the contractor that the work was done under requirements as to character and finish not fairly within the meaning of the specifications. \* \* \* He shall report in detail to the Congress of the United States his findings."

Very respectfully,

H. H. ROUSSEAU,  
*Chairman of Committee,*  
*Engineer of Terminal Construction.*

E. A. A. SMITH,  
*Member of Committee,*  
*Auditor.*

B. F. HARRAH,  
*Member of Committee,*  
*Special Counsel and Examiner of Claims.*

The above findings and recommendations are approved.

GEO. W. GOETHALS,  
*Governor the Panama Canal.*



## CLAIMS OF McCLINTIC-MARSHALL CONSTRUCTION CO.

PITTSBURGH, Pa., *October 14, 1914.*

Col. GEO. W. GOETHALS,

*Governor Canal Zone, Balboa, Canal Zone.*

DEAR SIR: We present herewith our claims for extra compensation on the Panama Canal lock gate contract, W.O. 23444, so that you can investigate these claims and report to Congress the amount due us in justice, equity, and fairness, in accordance with act S. 5147, copy of which is attached hereto, authorizing and directing you to make such investigation and report.

Yours, very truly,

McCLINTIC-MARSHALL CONSTRUCTION Co.  
C. D. MARSHALL, *President.*

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[PUBLIC, No. 119, 63d Congress.]

[S. 5147.]

AN ACT To authorize and direct Col. George W. Goethals, Governor of the Canal Zone, and formerly chairman and chief engineer of the Isthmian Canal Commission, to investigate certain claims of the McClintic-Marshall Construction Co.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That Colonel George W. Goethals, governor of the Canal Zone and formerly chairman and chief engineer of the Isthmian Canal Commission, is hereby authorized and directed to investigate the claims of the McClintic-Marshall Construction Company, a corporation of the State of Pennsylvania, having its principal office in the city of Pittsburgh, in said State, and to ascertain what amount, if any, is in justice, equity, and fairness due and owing to said McClintic-Marshall Construction Company from the Isthmian Canal Commission for work and labor done and materials furnished in connection with the construction and erection of lock gates and appurtenances for the Panama Canal, and in connection with or incidental to the doing of the work and furnishing of the materials provided for in a certain contract between the Isthmian Canal Commission and the said McClintic-Marshall Construction Company, dated June twenty-first, nineteen hundred and ten, taking into consideration the claim of the contractors that the work was done under requirements as to character and finish not fairly within the meaning of the specifications.

The said Colonel George W. Goethals, governor of the Canal Zone, is further authorized and empowered, either personally or through such commissions as he may appoint, to investigate such claims and the various items thereof in such manner as to him may seem best, and either personally or through such commission is hereby empowered to administer oaths and affirmations to witnesses, and to issue subpoenas and to compel the attendance of witnesses. He shall report in detail to the Congress of the United States his findings.

Approved June twenty-fourth, nineteen hundred and fourteen.

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### STATEMENT OF CLAIMS.

Hereinafter where the word "Commission" is used it refers to the Isthmian Canal Commission, and where the word "Contractor" is used it refers to the McClintic-Marshall Construction Co.

The Contractor claims extra compensation on above contract for the following reasons:

First. That the Commission failed to furnish, at the time of signing the contract, the necessary data for the execution of the work, and at times failed to approve the detail drawings promptly, thereby very much delaying the progress in the shop, increasing the manufacturing costs, diminishing the shop output, and holding up the work in the field to such an extent that an enormous expense was incurred in order to complete the work in the time required.

Second. That the Commission's engineers and inspectors demanded and received shopwork of a much more refined and costly character than that called for by the contract.

That for a long time both the engineering and inspecting organizations of the Commission at the shop were inadequate to handle the work.

That the Commission's shop inspectors were at times unreasonable, indecisive, and inconsistent, creating in the shop organization a state of uncertainty as to what would be acceptable to the inspectors.

That the Commission's engineers and inspectors forced the Contractor to make the sizes of the subpunched holes smaller than clearly specified in the contract specifications.

That all this very much delayed the progress in the shop, increased the manufacturing cost, diminished the shop output, and held up and increased the work in the field to such an extent that an enormous expense was incurred in order to complete the work in the time required.

Third. That the Commission failed to furnish, in accordance with the terms of the contract, sufficient and suitable unoccupied storage grounds on the Isthmus for the materials of the Contractor.

That the Commission obstructed the erection by its failure to keep water out of the lock chambers and in other ways.

That the Commission, through its engineers, by forcing the Contractor to punch the holes for the field rivets smaller than called for by the specifications, greatly delayed the work in the field and increased the erection cost.

Through these defaults of the Commission the work was delayed and the cost increased.

Fourth. That the Commission's inspectors on the Isthmus were unreasonable in their requirements.

That they insisted upon having the work executed contrary to the spirit of a previous agreement, and also on having work done distinctly not called for in the specifications.

That they exceeded their authority by prescribing the method under which the work should be erected and by insisting upon having this method carried out.

That on account of the inadequate shop painting and unreasonable inspection the Contractor was obliged to do unnecessary interior cleaning.

On account of the above the Contractor was seriously delayed and put to large extra expense.

Fifth. That taking into account the extension of time to which the Contractor was entitled on account of the delays caused by the



Commission he was required to and did complete the work in a much shorter time than that provided for in the contract.

That in order to meet these requirements of the Commission the Contractor had to resort to a large amount of rush work, which again caused enormously increased costs in the field.

That even if the delays previously described had not occurred much of this expensive rush work would have been necessary on the leaves at Pedro Miguel and Miraflores, as the masonry for these leaves was very much behind the dates established in the contract, making the time available for the erection of these leaves too short for carrying on the field operations in an economical way when the kind of work that had to be done in the field is taken into consideration.

Sixth. That the Contractor has not received adequate compensation for the water stops that had to be used to make the work watertight, although not called for on the plans or in the specifications.

#### SUBSTANTIATION OF FOREGOING STATEMENTS FORMING BASES OF CLAIMS.

First. That the Commission failed to furnish, at the time of signing the contract, the necessary data for the execution of the work, and at times failed to approve the detail drawings promptly, thereby very much delaying the progress in the shop, increasing the manufacturing costs, diminishing the shop output, and holding up the work in the field to such an extent that an enormous expense was incurred in order to complete the work in the time required.

The contract for this work is dated June 21, 1910, and provides—  
Article II, page 4:

The Contractor shall, on or before June 27, 1910, begin the preparation of the working drawings and make all other necessary arrangements for the prompt ordering of the material, etc.

Article IV, page 6:

The Contractor shall prepare and submit to the Commission, in duplicate, all necessary working drawings for the gate leaves and fixed parts, with detailed calculation of weights. Before any material is ordered or work begun, these working drawings must be approved by the chief engineer of the Commission or his authorized representative, and any material ordered or work done by the Contractor prior to the approval of the drawings shall be entirely at his own risk, etc.

Paragraph 120, page 23, I. C. C. Circular 576, states:

In order to detect any errors in the templets, etc., the Contractor shall erect at his works, without charge, one complete leaf of each different height included in this contract. Such leaves shall be carefully assembled and bolted together, but are not to be riveted up nor have the rivet and bolt holes reamed, etc.

From these requirements it will be seen that complete approved drawings had to be in the hands of the Contractor before he could order material and proceed with the fabrication, so that the typical leaves could be assembled at the Contractor's yards and shipment started.

These drawings, of course, could not even be prepared before complete and correct information was in hand.

This information, therefore, should have been in the Contractor's hands at the time the contract was signed, so that all work could be fabricated economically and expeditiously, and the necessary prog-

ress secured and maintained. This, however, was not the case, as is shown by the following:

(a) In order to correct some impracticable features of the original designs and, further, to secure some desirable improvements in the construction, an agreement embodying some 36 changes was made between Mr. Henry Goldmark, designing engineer of the Commission, and the Contractor, dated August 8, 1910.

(b) Manhole covers were changed many times and experimented with during many months. The drawings for these covers were approved March 21, 1911, but changes were made until August 21, 1911, 14 months after date of contract.

(c) Numerous other changes were made as the work progressed.

(d) The water-tight frames as originally designed were unsatisfactory, and a satisfactory frame was only secured after long and expensive experiments on the Contractor's part.

(e) The information for the pumping system was not complete until October 31, 1910, and for the mitering mechanism until March 29, 1911.

(f) The drawings for the first eight leaves were approved between October 29, 1910, and January 21, 1911. The late date of this approval is caused by the delay in getting the information, as the approval itself was quite prompt. The drawings for the last twenty-four 77-foot leaves, which were submitted for approval between October 1, 1910, and January 31, 1911, were approved January 18, 1912, approximately 12 months after being submitted. The drawings for the 82-foot leaves were submitted for approval April 15, 1911, and approved between March 6 and March 18, 1912, about 11 months after being submitted. The drawings for the 66-foot leaves were submitted April 22, 1911, and approved from March 6, 1912, to March 18, 1912, about 11 months after being submitted.

It should be noted that this final approval occurred from 20 to 21 months after the award of the contract.

On account of the above changes and delays the assembling of the first leaf at the shop could not be started until January 15, 1911, and was not completed until May 15, 1911.

According to the contract dated June 21, 1910, the Contractor was to commence the erection of the upper guard gates at Gatun January 1, 1911, and at Pedro Miguel March 1, 1911. It can readily be seen that if the Contractor was to keep these dates it would have been necessary for the Commission to furnish him very promptly all the necessary information covering the design of these lock gates.

It should be observed that important information was not furnished until eight months after the erection should have been started at the Isthmus.

It will thus be appreciated that the Contractor was seriously hampered in starting and handling this work promptly and economically, and that it was out of the question to meet the dates for starting work at the Isthmus established by the contract.

There can be no question that the delays and changes described above must have caused, and did cause, the Contractor considerable extra expense in the preparation of the shop drawings, for which he justly will claim compensation, and it is further self-evident that these delays are the first cause for the very expensive rush work that had to be resorted to later on to meet the Commission's wishes as to the final completion of the gates.

A report has been prepared by the Contractor's chief engineer, Mr. Paul L. Wolfel, covering the changes and delays in receiving information and having drawings approved, which goes into these matters in detail, and is submitted with the claim. (See Appendix.)

Second. That the Commission's engineers and inspector demanded and received shopwork of a much more refined and costly character than that called for by the contract.



That for a long time both the engineering and inspecting organizations of the Commission at the shop were inadequate to handle the work.

That the Commission's shop inspectors were at times unreasonable, indecisive, and inconsistent, creating in the shop organization a state of uncertainty as to what would be acceptable to the inspectors.

That the Commission's engineers and inspectors forced the Contractor to make the sizes of the subpunched holes smaller than clearly specified in the contract specifications.

That all this very much delayed the progress in the shop, increased the manufacturing cost, diminished the shop output, and held up and increased the work in the field to such an extent that an enormous expense was incurred in order to complete the work in the time required.

The general character of the work contemplated under the specifications for the lock gates is indicated by the following paragraph in Circular No. 576, being an invitation for proposals to furnish and erect 46 mitering lock gates. The paragraph referred to is as follows:

In making the award, no bidders will be considered who are not manufacturers of high-grade structural, bridge, or ship work, of such character as is required in the specifications, or whose facilities for furnishing the material in the time specified and of the quality required shall not be, in the opinion of the Commission, sufficient for the purpose.

Before the contract was awarded, the Commission's representatives investigated the Contractor's plant as to facilities and capacity for turning out the work, and they also investigated his record for executing satisfactorily "high-grade structural and bridge work."

The Commission's investigation evidently showed the Contractor's plant to be properly equipped and the quality of his work high grade in every particular, as they raised no question whatever about awarding the contract for the lock gates to said Contractor.

There is another and a higher grade of fabricated structural steelwork than that which is known as "high-grade structural and bridge work." This higher grade of fabricated work is generally known as "machine-shop work." The difference consists largely in the degree of accuracy required in the details of fabrication and the tools and methods employed in securing this greater degree of accuracy and refinement. The Canal Commission was evidently fully aware of the difference between these two classes of work, as is shown by the following paragraph which appears in their subsequent specifications for "rising stem-gate valves," Circular No. 636:

These valves are machines and must be constructed as a machine-shop job.

The latter specifications provided for certain limits of variation, and these limits are considerably greater than those allowed by the lock-gate inspectors.

When the Contractor started the shopwork on this contract the Government had little or no organization to look after the shop inspection. A large part of the first eight leaves was manufactured according to the Contractor's interpretation of the specifications, and with the same care and methods that he had been accustomed to use on other high-class bridge and structural steelwork.

When the first leaf was assembled at the Contractor's shop, the work did not fit with the precision, as to details, demanded by the chief inspector. No work up to this time had either been accepted or rejected, but in going over the assembled leaf the inspector practically condemned all work up to that time. After a long and serious

delay the Contractor was made to realize that the inspector would and did require that the remaining work be done with the precision and accuracy of a machine-shop job. This necessitated an entire readjustment of the shop methods, increasing the cost, reducing the output, and delaying the work generally.

After Mr. Goldmark had come up from the Isthmus and personally gone over the work, the work held up on the original eight leaves was finally accepted conditionally. The material was sent to the Isthmus, erected and completed, and accepted. The results were far better than the Commission ever had hoped to secure under the specifications, thus proving that the inspectors were not justified in demanding the degree of accuracy on which they insisted.

Under these circumstances it is only just that the Government should pay the extra cost of the shop work and reimburse the Contractor for the delay and extra cost of erection occasioned thereby.

We give below a statement of some of the important and unreasonable demands made by the inspectors in regard to shop workmanship:

(a) The precision demanded in the spacing of the punched and drilled holes was so exacting that the Contractor was obliged to abandon, except for the first eight leaves fabricated, his customary method of using wooden templets and substitute therefor steel templets and arrange to punch the holes of smaller diameter than called for by the specifications.

(b) It was required that the plates be turned and calipered in the shop before any work was done on them, a most unusual and unreasonable shop requirement.

(c) Plates and shapes as commercially rolled are never theoretically perfect, either in finish, dimensions, or shape. Nevertheless, in a number of the different parts the Contractor was compelled to correct these imperfections by an excessive amount of work.

(d) The workmanship required on the turned bolts was of such an exacting nature that the Contractor was compelled to abandon the manufacturing of them. These bolts were subsequently made by another concern, by a man whom the Contractor had employed on machines of the same make as those on which the bolts were finally made.

(e) The unreasonableness of the inspection is also shown by the causes for which a large amount of material was rejected at the shop before and after fabrication.

The specifications for the lock gates covering the chemical and physical requirements for the steel are about the same as for high-grade structural, bridge, or ship work, with the exception that the specifications for high-grade structural, bridge, and ship work do not specify perfection, as will be noted from the extracts of specifications given below for the largest structures now being constructed in this country and Canada:

New York Connecting Railroad, Hell Gate Bridge over East River, 80,000 tons:

The finished material shall be free from injurious seams, flaws, cracks, or defective edges, and have a clean, smooth finish.

Quebec Bridge over St Lawrence River, Quebec, Ontario, 80,000 tons:

The finished material shall be free from injurious seams, flaws, cracks, or defective edges, and have a clean, smooth finish.



### New York State Barge Canal:

Finished material shall be uniform in character for each specified kind, clean, smooth, straight, true to shape, of workmanlike finish, and free from cracks, flaws, blisters, injurious seams, ragged edges, surface imperfections, or other defects.

### Mississippi River bridge, Memphis, Tenn.:

All steel shall be of uniform quality of each class. It shall be straight, without buckles or kinks, and free from injurious seams, flaws, cracks, excessive scale and pitting, and other defects.

Metropolis Bridge over Ohio River, Chicago, Burlington & Quincy Railroad, 17,000 tons:

Finished material shall be free from injurious seams, flaws, cracks, defective edges, or other defects, and have a smooth and uniform and workmanlike finish.

### Standard specifications, structural steel for ships:

The finished material shall be free from injurious seams, slivers, flaws, and other defects and shall have a workmanlike finish.

### Lock gates, Panama Canal, I. C. C. Circular No. 576:

Plates and shapes must be free from slag, foreign substances, brittleness, hard spots, laminations, sand, or scale marks, snakes, pits, and defects generally. Shapes must also be free from defective sections, shaded backs, grooved fillets, imperfect edges, crookedness, etc.

From the above extracts it will be noted that the material for structural, bridge, and ship work shall be free from injurious defects, but in the case of the lock gates it simply states that the material must be free from defects.

The Commission's inspectors felt it their duty to see that material was furnished in accordance with a literal interpretation of the specifications and would accept nothing but practically perfect material. This accounts for the tons upon tons of material that was needlessly rejected and for which claim will be made.

The clauses covering "Workmanship" in the specifications for "high-grade structural and bridge work" are as follows:

New York Connecting Railroad, Hell Gate Bridge over East River, 80,000 tons:

The magnitude and character of the construction and the accuracy required will make frequent consultation with the engineer advisable, to the end that all workmanship, whether particularly specified or not, shall be the best which present practice or improvement therein will admit of. The decision of the engineer on any question arising in this respect shall be final.

Quebec bridge over St. Lawrence River, Quebec, Ontario, 80,000 tons:

The workmanship and finish shall be the best that the most suitable modern machinery and skilled labor to be obtained can give to meet these specifications.

### New York State barge canal:

All workmanship shall be in every particular of the best in use at the present time. In any case of doubt as to the quality of work required by these specifications that interpretation shall be given which shall secure the best class of work.

Lack of facilities shall not be considered as sufficient excuse for poor or inferior workmanship.

### Mississippi River bridge, Memphis, Tenn.:

The work must be of the best class now in use, and the plans and specifications shall never be interpreted as meaning anything but the very best kind of work in all respects.

Metropolis Bridge over Ohio River, Chicago, Burlington & Quincy Railroad, 17,000 tons:

The workmanship and finish shall be equal to the best practice in modern bridge works.

Lock gates, Panama Canal, I. C. C. Circular No. 576:

All workmanship must be first class in every particular, and all methods used during manufacture shall be satisfactory to the chief engineer or his authorized representatives. Material undergoing fabrication will be inspected by the inspectors employed by the Commission.

It will be seen from the above that the workmanship for the best grade of bridge work must conform, or be equal to, the best practice in modern bridge works. The workmanship for the canal gates must be first class as interpreted by the authorized representative of the chief engineer.

The Commission's specifications for the lock gates, both for shop and mill, throw the doors wide open to an inspector to be extreme in his requirements, consequently no one but a man of long and wide experience should have been put in charge of the inspection of this undertaking, the greatest of its kind ever attempted.

Mr. J. M. Hammer, assistant engineer of the Commission, was put in charge of all work for the lock gates in the United States. He had supervision of the preparation of all drawings and bills, and had to approve the same; he had to approve all bills rendered by the Contractor, and at the same time had to look after all work at the mills and shops through an inspection force that he had to organize.

The Contractor has reason to believe that when Mr. Hammer was put in such extensive charge of this great undertaking this was the first time that he had any connection with the actual execution of work at the mill or shop; that all his previous experience was confined to drafting and designing in the office as assistant to other engineers; and that never before had he been connected with—much less been in charge of—structural, bridge, or ship work during its execution in a shop, as is shown by his own record. In his application to the American Society of Civil Engineers for membership, under date of October 15, 1912, he gives his experience, or record, as follows:

Hammer, Johannes Marcellus—Pittsburgh, Pa. (Age 38. Born Trondhjem, Norway.) (Civ. Engr. course Teck. Coll., Trondhjem, Norway, 1896)—1896 to 1900 (about 4 years) Engr. Asst. with Govt. of Norway, on building of fortifications at Trondhjem and Kristianssand, during 1899 and 1900 to a great extent in charge of field work; 1901 Engr. Asst., on building of municipal waterpower plant and electric street railway at Trondhjem; 1902 and 1903 (two terms) student, civil engineering, Polytechnic Inst., Zurich, Switzerland; Feb. to July (about) 1904 Draftsman, Foundation Co., New York City; 1904 to April 1905, Transitman, Central R. R. of N. J.; April 1905 to Sept. 1906, with Foundation Co., making and checking plans for caissons, air locks, derricks, pile drivers, etc.; Sept. 1906 to Sept. 1907, Designer and Checker of Bridges and other structures, New York Central R. R. Co., New York City; Sept. 1907 to date Asst. Engr. Isthmian Canal Commission, principally on preparation of design for lock gates at Panama Canal, since Aug. 1910 in charge of mill and shop inspection, and approval of shop drawings and bills for lock gates.

Mr. Goldmark, in his eagerness to obtain the very best for the Commission, and with the quite natural pride a designing engineer takes in his work, also possibly on account of his knowledge of the inexperience of the assistant engineer put in charge, often by word



of mouth and in correspondence stated that no other but perfect work would be accepted. It can readily be seen that with such instructions and no previous experience to guide him, the assistant engineer in charge would insist upon work far superior to what is customary in high-grade structural, bridge, or ship work, and that his interpretation of the specifications as to the first-class workmanship would hardly confine itself to the best practice of bridge or ship work so well established.

It is a very difficult matter for a manufacturer to satisfy an inexperienced inspector, especially one who also has been one of the designers of the work. In this case the result has been that the Contractor did not have to furnish a serviceable structure following the lines of best practice, but a structure as near perfect as human brains and human skill could make it.

As a matter of fact, on account of his long experience, Mr. Goldmark's own interpretation of the perfection necessary in the work was much more liberal than Mr. Hammer's. This is borne out by the fact that the Contractor was not allowed to ship the first eight leaves, even conditionally, until Mr. Goldmark had personally gone over the work.

The foregoing explains the close limitations imposed upon the Contractor in the execution of the work and the strictness with which these limitations were enforced. This also accounts for the difficulty of getting an inspection force organized to take care of the work properly and promptly under such close limitations. The Contractor suffered greatly from this lack of organization, at times having his shop and his yards completely blocked by work waiting for inspection, causing most serious delay and expense. This condition was aggravated by the chief inspector being changed twice, in each instance the force getting seriously upset. This matter became so serious that under date of April 18, 1911, ten months after date of contract, a strong letter was written to Mr. Hammer by the Contractor's chief engineer, from which we quote as follows:

You will see from this that our shop is away ahead of your inspection force. It is further unquestionably true that our shop is gaining on your force all the time, which makes the situation become more aggravated every day. If relief is not furnished soon, the time is not so very far off when we will practically have to shut down our shop in order to enable your men to sufficiently catch up with the inspection until such a time that the congestion is sufficiently relieved for us to resume operations.

You will probably have to more than double your force to keep up with the current work, as every day's work should be inspected and finally passed on as soon as, or even before, it leaves the shop, so that the sand blasting and painting can finish up the operation and the material can expeditiously be shipped. In addition to the regular force that looks after the inspection and measuring up of the steelwork, special men will be required at the pickling plant, at the sand blast, and at the scales, so the writer feels that he is not very much out of the way if he expresses the opinion that you will have to more than double your present force.

Now, to get relieved of the stagnation that has now taken place on account of us having such a large mass of material on our hands uninspected is another question, and a very serious one at that. It seems to the writer that it might be a wise policy to call in a well organized inspection bureau to help out on this work until the output of the shop and the amount of work that your inspection force can handle are properly balanced. The Pittsburgh Testing Laboratory, R. W. Hunt, William R. Webster, Allan Colby, or any other first-class inspection bureau, will be equally acceptable to us and could undoubtedly be of very material service to relieve the present situation.



The statements made above are not in any way intended as a reflection on Mr. Hammer, whose ability as an engineer and designer, and whose conscientiousness and industry we thoroughly appreciate and admire. He got the very best possible for the Commission, but in doing so imposed great hardships on the Contractor. It was no small task, indeed, to personally pass on 52 data sheets, giving information of the most complicated nature which formed the foundation for all the work, check and approve 300 large and intricate drawings, 266 bill sheets, 1,141 tables of quantities and weights, and also check and pass through for payment 14,719 invoices, and at the same time get missing information and look after necessary changes that developed while the work was going through, and, besides all this, get an inspection force organized for mill, shop, foundry, etc., and look after 24 to 50 inspectors and clerks, the work being scattered over more than 30 different places. Mr. Hammer thought it was his personal duty to do all this, but no man was ever born who had the capacity to do what he had undertaken in the time allotted.

The exceedingly fine requirements of workmanship demanded are amply illustrated in the following extracts from a letter written by Mr. John N. Ostrom to the Contractor under date of March 2, 1911. Mr. Ostrom is a bridge engineer, who has devoted practically all of his time for the past 30 years to the inspection of material and workmanship for bridges and steel structures. He is thoroughly familiar with the best practice in bridge work. The Contractor tried to employ Mr. Ostrom to take charge of the work in the shop in order to have the Contractor's men so manufacture the work that it would meet the requirements of the Commission. This the Contractor was unable to do as explained in his letter.

I told you verbally the other day at a conference in your office that I would not be willing to go ahead with the Panama Canal lock gates for the reason that I considered it impossible to meet the requirements of the Government, as I understand it, namely, to get all the holes of length, breadth, and height punched so accurately that they would clean up in reaming, particularly the holes punched in the curved flange angles before they were bent.

I made this statement after several days of careful personal examination of the conditions at your plant, and as they seemed to me practically impossible I declined to go ahead with the work, since I would not attempt anything unless satisfied that I could deliver the goods.

But I do not consider the work at all impossible or impracticable under the specifications if interpreted along the best lines of first-class shop work, and on this line I wish to call your attention to several points.

No railroad bridge or other important structure was ever built where all the subpunched holes cleaned up perfectly to the nominal size, unless it was a combination of accidents where the + and — errors neutralized one another. Absolute accuracy is not even expected in first-class work. On the contrary, it is known that errors will occur, and when they are discovered the problem is how to make the work just as safe as designed without throwing away the material.

In connection with the shop work, we submit herewith copies of three letters; the first a letter from Mr. Price, chief inspector, to Mr. Hammer, of the Commission, criticizing the workmanship on the lock gates; the second, the reply of Mr. Wagoner, inspector for the Contractor, dated February 29, 1912, addressed to Mr. Conley, general superintendent for the Contractor; the third, the reply dated March 5, 1912, of Mr. Reed, superintendent of shop No. 2 for the Contractor, addressed also to Mr. Conley.



*Mr. Price to Mr. Hammer.*

FEBRUARY, 1912.

Output of shop has averaged 100 tons per day.

Conditions of workmanship: I regret to state that the workmanship in many respects is not up to our standard at the present time, and is not equal to work which has been turned out for the lock gates for the last six months or more. This refers especially to the least important members and certain conditions in the larger members, and shows poor and careless workmanship. In this respect, I wish to call your notice to the footwalk frames as reported February 15; the chamfered edge of chord angles as reported February 20, manhole covers as reported February 21, and also conditions of A frames. Many of the end stiffener angles of A frames are either milled below the limit of thickness allowed or are not milled at all in certain parts, and to-day, for the first time in several months, we found a number of the stiffener angles too short to bear properly on the flange angles. There must be some cause for this condition at the present time.

I wish to refer you to my last semimonthly report which states that during a certain period hundreds of A frames were fabricated which required little or no correction.

Bent plates: This member, which has never been entirely satisfactory, owing to its construction, which makes it difficult to fabricate and check, is open to severe criticisms. A number of the eleven-sixteenth inch holes have been reamed 1 inch by mistake, as reported February 20. Many of the countersunk rivets do not fill the countersink, and many are chipped below the surface of the end and bent plates. The planed edge which takes the thrust of the sheathing is in many cases not thoroughly planed, and the milled ends are not satisfactory in many instances. Paragraphs 20 and 21 of the original specifications call for the entire surface of end plates to be planed to a true surface after erection. This was modified by Mr. Goldmark August 8, 1910, to plane in the shop instead of in the field, and modified later to allow the end plates to be fabricated and accepted without planing, provided the work proved to be satisfactory. Taking into consideration the modification of the original contract, the shop should make special efforts to get this member satisfactory.

Respectfully,

CHIEF INSPECTOR.

*Mr. Wagoner to Mr. Conley.*

RANKIN, February 29, 1912.

MR. CONLEY, General Superintendent:

In reply to attached letter from Mr. Price, chief inspector, Isthmian Canal Commission, I beg to advise that the shop is not doing poor and careless work; but, on the other hand, I believe we are putting more time on finishing the work than at any time since the work started. The footwalk frames referred to are the irregular shaped ones, samples of which can be seen in the section of leaf now assembled in the yard. The shop tried to rivet the frames without going to the expense of making so many special frames to hold them while riveting, but found they could not hold them, so are making frames to rivet them in and also shape up the ones already made.

The chamfered edge of chord angles mentioned are short angles that carry one footwalk which call to have them rounded off, and a number of these should be and will be gone over.

Manhole covers: Round corners were not exact to templet, but have clearance provided all around.

A frames: When these frames were held up last week, I personally remarked to Mr. Price that I thought it was ridiculous for any man to hold these frames up, for out of the whole lot of them there were not more than two or three that were open to a difference of opinion. As you know, when it came to a show down, the whole lot of them was taken, about 16 frames.

Bent plates: The bent plates being fabricated to-day, I believe, are as good as any that have been made, and certainly far superior to the first ones. A shop should not be charged with poor and careless work because now and then a few holes are reamed wrong size, a chipper gets slightly low in chipping countersunk heads, or heads chip off on account of brittleness of rivets.

I do not believe that Mr. Price ever got better work than we are giving them, and I do not think he ever got as good. When you sum the whole letter

up, you will readily see that there is no cause for writing a letter of complaint on the things mentioned, for any of these minor things as mentioned are always corrected without any fuss or trouble.

W. N. WAGONER.

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*Mr. Reed to Mr. Conley.*

RANKIN, March 5, 1912.

Mr. CONLEY, *General Superintendent*:

In reply to attached letter from Mr. Price, chief Government inspector, I can not see any cause for complaint against the workmanship at the present time. The inspectors are making us do a lot of extra work which we had not done previously. According to Mr. Price's letter, this extra work must be the means of bringing it away from their standard.

The footwalk frames referred to are the irregular shaped ones; samples of these can be seen in the section of leaf now assembled in yard. We tried to rivet the frames without going to the expense of making so many special frames to hold them while riveting, but found they could not hold them in proper shape, so we are making frames to rivet them in; also shape up those already made.

They are rechamfering the edges of the guard rails for the footwalk in the machine shop now. These, they claimed, were not a good job. On the man-hole covers, there was plenty of clearance all around. The inspectors made us do extra chipping on these, which left a large hole on the corner.

When the A frames were held up last week I told Mr. Hammer that there was only one out of the whole lot that I thought he could raise a question on; that one had a short chord angle. After he looked them over, he accepted them all. The bent plates that are being fabricated at the present time are as good as any we have turned out, with the exception of a few plates that had some rivets countersunk a little too deep, which made the heads a little below the level of the plate.

I think it would be well if Mr. Price would see that his men would get on the job, and do their work without having to be coaxed to inspect certain pieces, and they would be sure that these pieces were made to fit at the place they belonged, and do away with a lot of unnecessary polishing, which does the work no good after it is erected. Sometimes you can do too much on a job, which does more harm than good.

As far as shopwork is concerned at the present time, I think we have as good a standard of work as there is put out anywhere. Any corrections that had to be made received my personal attention as soon as I was informed of them.

Respectfully,

J. F. REED, *Superintendent*.

In the first letter—report of Mr. Price to Mr. Hammer—particular attention is called to the statement relative to end plates in the paragraph headed "Bent plates," in which is stated that the requirements of the specifications that the end plates should be planed to a true surface after erection, was modified by Mr. Goldmark, designing engineer, for the Commission, August 8, 1910, to plane in the shop instead of in the field, and modified later to allow the end plates to be fabricated and accepted without planing, provided the work proved to be satisfactory, as this matter will be referred to again.

The bolts that were required for the lock gates as called for in paragraph 34 of the Commission's specifications the Contractor was aware would have to be very carefully made. This paragraph reads as follows:

All bolts connecting heel, pintle, and end reaction castings to the leaf shall be turned to a driving fit.



On account of the carefulness with which the work would have to be done, the Contractor purchased a special machine and employed an expert bolt maker in order that there would be no doubt about producing acceptable work.

Below is given letter of Mr. C. M. Neeld, manager of the Rankin works of the Contractor, to Mr. Conley, general superintendent, cautioning him that special care must be taken in the manufacture of these bolts:

RANKIN, November 15, 1910.

Mr. T. CONLEY,  
*General Superintendent:*

On the turned bolts for Panama work, for which we have bought a 2-inch triple bolt cutter with milling attachment, please take it up with the smith shop and see if they have any means devised by which they can be sure that the thread is cut so that it will bring the face of the finished nut at perfect right angles to the body of the bolt. Milling and thread cutting will be two separate operations, and there is a possibility, in fact a probability, of the bolt not having exactly the same direction on the two settings, unless special care is taken.

Very close inspection will be made on this by the Government inspection, and we want to be sure that it is provided for.

C. M. NEELD, *Manager.*

Notwithstanding all of the precautions taken by the Contractor to manufacture the bolts to satisfy the Commission, the work had to be abandoned, the materials and machine purchased discarded, and the order placed with the Pittsburgh Screw & Bolt Co. to furnish the bolts.

Now, note the letter given below from bolt maker S. Kress, whom the Contractor had employed to make the bolts, and who, after the work had to be abandoned, was employed by the Pittsburgh Screw & Bolt Co. This letter is addressed to Mr. S. C. Boocks, foreman of the blacksmith shop for the Contractor.

PITTSBURGH, PA., July 1, 1914.

McCLINTIC-MARSHALL CONSTRUCTION Co.,  
Mr. S. C. BOOCKS,  
*Pittsburgh, Pa.*

GENTLEMEN: Confirming advice to your Mr. Guskey, this is to advise you that after I left your employ I went to work for the Pittsburgh Screw & Bolt Co., making turned bolts for the Panama lock gates. The number of bolts rejected made in the plant of the Pittsburgh Screw & Bolt Co. was comparatively few. I made these bolts on the same machine and in exactly the same manner as I had previously made them at your plant at Rankin. The bolts which I made for you were just as good, and probably somewhat better, than those which I made for the Pittsburgh Screw & Bolt Co.

S. KRESS.

It is here stated that Kress made the turned bolts for the Panama lock gates for the Pittsburgh Screw & Bolt Co., and that the bolts were satisfactory, while the bolts he manufactured for the Contractor were just as good, if not better, and were rejected.

Here is brought out a condition of the inspection that needs no comment. The Contractor was not only obliged to furnish work of a higher class than called for by the specifications but also was obliged to submit to inspection of this character. Whatever the cause of this unreasonable and inconsistent inspection is not so pertinent. That it was unreasonable and inconsistent is what affected the Contractor and added great expense, which he should not justly be called upon to bear.

Below is given, without comment, an interview between Mr. E. W. Pittman, manager for the Contractor at the Rankin plant, where the lock gates were manufactured, and Mr. Oliver A. Harber, one of the inspectors for the Commission at the Contractor's plant. This interview was at Mr. Harber's home on August 25, 1914:

Mr. PITTMAN. Mr. Harber, we have filed with the Government a claim for extra compensation on the lock-gate contract on account of the unreasonable requirements of the shop inspectors during the fabrication of the work at Rankin, and we are seeking disinterested testimony in support of our claim. Will you permit me to question you as to some phases of the inspection and submit your testimony with our claim?

Mr. HARBER. Yes.

Mr. PITTMAN. During what time were you employed by the Isthmian Canal Commission as an inspector on the lock-gate work at our Rankin shop?

Mr. HARBER. Fifteen months. May 16, 1911, to August 16, 1912.

Mr. PITTMAN. What portion of the work was assigned to you for inspection?

Mr. HARBER. Girders and some of the A frames.

Mr. PITTMAN. Was this portion of the work executed to your satisfaction?

Mr. HARBER. Yes.

Mr. PITTMAN. How did the workmanship compare with that of other first-class structural work that you have inspected?

Mr. HARBER. It was better.

Mr. PITTMAN. Was there any question in your mind as to the acceptability of the large lot of girders that were held up for such a long time and finally accepted?

Mr. HARBER. No.

Mr. PITTMAN. Did you become familiar by general observation with portions of the work assigned to other inspectors?

Mr. HARBER. Yes.

Mr. PITTMAN. Do you not think that the other inspectors were unreasonable in their requirements as to precision in fit and finish?

Mr. HARBER. Yes.

Mr. PITTMAN. Was the progress of the work unreasonably obstructed by their methods of inspection?

Mr. HARBER. Yes.

Mr. PITTMAN. Did you often notice a congested condition of the lower end of the shop, due to work being held up by inspectors?

Mr. HARBER. Yes.

Mr. PITTMAN. Do you not think this could have been avoided if the inspectors had cooperated with us?

Mr. HARBER. Yes.

Mr. PITTMAN. Have you any further statement to make?

Mr. HARBER. Yes. If some of the inspectors had given more intelligent attention to the work assigned to them instead of spending their time gossiping and criticizing other inspectors, much trouble would have been avoided, and the progress of the work would have been greatly improved.

On difficult work of this sort it is good policy for an inspector to make careful observations on the various pieces at intermediate stages of their manufacture instead of waiting until the pieces are entirely finished before inspecting them. This practice obtains better results for the purchaser and at the same time aids the progress of the shopwork. It is the duty of an inspector to foresee and avoid shop errors and imperfections and thus reduce to a minimum the number of corrections to be made in a finished piece. Some of the inspectors failed to take this view of their duties.

Much time was wasted taking micrometer measurements of rough shapes and plates in an effort to determine in advance the thickness to which work would pack out. In most cases the amount of this packing was unimportant, and the method of determining it was impractical. This measuring hindered the shopwork and did not give any useful information.

I have had over 25 years' experience in various branches of the inspection business and have gained experience in steel manufacture and shopwork of all kinds from rough to finely finished work required by the best specifications. The very highest grade of work was demanded and received on the lock gates.



It has been stated before that the Contractor was forced to use much smaller holes than called for in the specifications. Paragraph 36, page 12, I. C. C. 576, states:

Material under three-fourths inch thick shall be punched with a punch one-eighth inch less in diameter than the nominal size of the rivet. After the material is thus punched or drilled, it shall, after assembling in the field, have all holes reamed out to a diameter one-sixteenth inch larger than the nominal size of the rivet.

In accordance with this, the Contractor should have punched three-fourths-inch holes for seven-eighths-inch rivets to be reamed to fifteen-sixteenths inch; seven-eighths-inch holes for 1-inch rivets to be reamed to  $1\frac{1}{16}$  inches.

The first leaves under contract 4845—eight 54-foot 8-inch leaves—were so gotten out. Then trouble arose about these leaves at the shop. It was demanded from the Contractor that these holes be punched smaller—eleven-sixteenths inch throughout. Contracts 4847 to 4859 were so gotten out. Mr. Jewel, the Contractor's manager of erection at the Isthmus, objected to this and apparently took this matter up with Mr. Goldmark, as the Contractor received from Mr. Hammer, under date of January 12, 1912, the following note:

I am in receipt of the following cable from the Isthmus: "Permit all rivet holes to be punched thirteen-sixteenths inch in shop. Die must not be more than one thirty-second inch larger than punch." I am inclined to think it will be best to begin this new arrangement on the first new contract which will go through the shops. It is requested that this office be advised the contract numbers on which you will punch rivet holes thirteen-sixteenths inch, as above indicated. It is also requested that shop drawings be revised in this respect for the new contracts.

On the strength of this, contract 4861 was gotten out with three-fourths-inch holes for seven-eighths-inch rivets, and thirteen-sixteenths-inch holes for 1-inch rivets, the three-fourths-inch holes instead of thirteen-sixteenths-inch holes being apparently a concession to meet Mr. Hammer's wishes.

Later on further objections were raised by Mr. Hammer to these larger holes, so that all the rest of the work had to be gotten out with eleven-sixteenths-inch holes throughout.

These small holes caused most serious delay and enormous expense in the field, as will be brought out later.

Third. That the Commission failed to furnish, in accordance with the terms of the contract, sufficient and suitable unoccupied storage grounds on the Isthmus for the materials of the Contractor.

That the Commission obstructed the erection by its failure to keep water out of the lock chambers and in other ways.

That the Commission, through its engineers, by forcing the Contractor to punch the holes for the field rivets smaller than called for by the specifications, greatly delayed the work in the field and increased the erection cost.

Through these defaults of the Commission the work was delayed and the cost increased.

Article 5 of the contract states:

The following materials, services, and means will be furnished by the Commission:

Suitable unoccupied grounds for the storage of the materials, convenient to the several lock sites, properly graded, and provided with sufficient railroad tracks of 5-foot gauge.

The construction and maintenance of a railroad track close to one of the side walls of the locks and wherever feasible along the whole or a part of the other wall.

All necessary switching service from the storage grounds to the different gate sites and a reasonable number of flat cars of 5-foot gauge for the use of the contractor on the work.

The storage yards mentioned were not furnished by the Commission, nor did they, from the records of the Contractor, ever attempt to do so. As to whether the Commission deliberately broke the contract, in order to save all the expense possible and forced the Contractor to get along as best he could, is a matter that will now be considered. The representative of the Contractor in charge of the erection of the lock gates on the Isthmus from the start of the erection until about September 1, 1912, was Mr. L. L. Jewel, who, on account of ill health, is unable to make any statement. If Mr. Jewel made any agreement with the Commission relieving the Commission of their obligation to furnish the storage yards, the Contractor has no record of it. There are on file in the Pittsburgh office of the Contractor two drawings prepared by the Contractor showing general arrangement of erection plant and power-house foundations required in the erection of the lock gates for both the Atlantic and Pacific divisions, and on these plans are shown two parallel tracks about 150 feet from the lock wall, running parallel full length of the lock chamber. These plans may have been submitted to the Commission with the idea that if the tracks shown were furnished and would be unoccupied, then the Commission would be relieved of furnishing the storage yards.

In the following letter of Mr. Henry Goldmark, designing engineer for the Commission, to Mr. L. L. Jewel, it will be seen reference is made to an erection diagram submitted by Mr. Jewel, evidently one of the drawings referred to above:

CULEBRA, November 1, 1911.

Mr. L. L. JEWEL,  
*Manager of Erection, Gatun, Canal Zone.*

SIR: Replying to yours of October 28, regarding track on back fill at Pedro Miguel:

Mr. Watt tells me to-day that his foreman has instructions to put in the tracks exactly as shown on your blue print, meaning, I presume, the erection diagrams submitted by you. I understand that this arrangement of tracks will be satisfactory to you. Mr. Watt also tells me that this fill will be rock, so that there should be no trouble as to settlement, etc.

Yours, truly,

HENRY GOLDMARK, *Designing Engineer.*

During the year 1911 and the early part of 1912, after the Contractor had commenced work at Gatun and also at Pedro Miguel, the correspondence between the Commission and the Contractor shows that the Contractor was constantly delayed and frequently interrupted in the handling of the work on account of insufficient storage grounds, and the work stopped at numerous times by the interference of trains of the Commission on the same tracks on which the Contractor was trying to work. From this correspondence it is quite evident that if there was any agreement to relieve the Commission of its obligation to furnish the storage yards, then the Commission failed to keep its second agreement in not completing the back fill at the lock walls in time to give the Contractor uninterrupted tracks to work on. In the correspondence in the possession of the Contractor there is no explanation on the part of the Commission as to why these storage yards were not furnished.



Note below letter from Col. H. F. Hodges, acting chairman, to Mr. L. L. Jewel:

CULEBRA, June 15, 1911.

Mr. L. L. JEWEL, *Manager of Erection,*  
*McClintic-Marshall Construction Co., Gatun, Canal Zone.*

SIR: The receipt is acknowledged of your letter of June 2, 1911, in which you ask reconsideration of decision that rails located on your erection bridges are not properly to be considered yard tracks, and therefore are not properly to be furnished without charge by the Isthmian Canal Commission.

The matter is not of very great importance, and I would gladly yield to your view if I could bring myself to the point where I thought it would be proper to do so. Article 5 of the contract required the Commission to furnish free of charge suitable unoccupied lands convenient to the several lock sites, properly graded and provided with sufficient railroad tracks of 5-foot gauge; also that it construct and maintain a railroad track close to one of the side walls of the lock and wherever feasible along the whole or a part of the other wall. I can not force from this wording the construction that the track on your erecting bridge is part of the yard which the Commission should furnish, and I must therefore adhere to the ruling already made, that the rails for this track are not properly to be furnished free of charge by the Commission.

I regret that I am unable to see the matter from your point of view.

Respectfully,

H. F. HODGES, *Acting Chairman.*

This letter, as it will be seen, declines to furnish some extra rails to carry tracks across the erection bridges. It also clearly states what the Commission is obligated to do by the contract in the way of furnishing suitable unoccupied storage grounds, but gives no explanation as to why these storage grounds were not furnished.

In the letter given below addressed to Mr. S. B. Williamson, division engineer of the Pacific division, signed by the chairman and chief engineer of the Commission, instructing Mr. Williamson to extend a certain track and thus make additional storage room for the Contractor, reference is made here that under the terms of the contract by extending this track the Commission would avoid the cost of switching charges which they would be required to do if the storage grounds had been furnished in accordance with the contract.

CULEBRA, CANAL ZONE, January 4, 1912.

Mr. S. B. WILLIAMSON,  
*Division Engineer, Pacific Division, Corozal, Canal Zone.*

SIR: Referring to the request of December 21 of the manager of erection of the lock gates for additional storage room at Pedro Miguel for his material, and to subsequent correspondence on the matter, including your letter of December 23, I believe that the cheapest and most convenient way of handling this matter under the terms of the contract will be to provide additional storage ground by extending a track from the present main-yard track back of the tool house and office of the McClintic-Marshall Construction Co. at Pedro Miguel, where there is sufficient area practically level to provide for additional storage, the same to be laid by the Pacific division at the expense of the Commission. In this way the cost of switching, which, under the terms of the contract, would have to be borne by the Commission, will be eliminated.

Please proceed accordingly.

Respectfully,

GEO. W. GOETHALS,  
*Chairman and Chief Engineer.*

(Copy to Jewel and Guynn.)

There is no question that the Commission saved a large amount of money by not furnishing storage grounds in accordance with their obligation—the cost of the storage grounds and tracks, and also



the switching charges, as an engine and a train crew would have had to be in constant attendance at each lock, supplying the Contractor with the material covering the entire period of the erection of the work, which occupied over two and one-half years' time. For the rapid and economical handling of the work the Contractor should have been furnished with storage yards and tracks and switching, as stated in the specifications. In a work of the magnitude of the construction of the lock gates, before each pair of gates was started the material for these gates should have been in the storage yards, properly sorted, adjacent to the lock where it was to be erected, so that each different piece could be gotten as quickly as it was wanted.

The storage yard adjacent to the locks at Gatun should have been large enough to store, properly handle, and sort material for 10 gates, or 20 leaves, complete; at Pedro Miguel for 6 gates, or 12 leaves, complete; and 7 gates, or 14 leaves, at Miraflores. After the erection was once started it would have insured rapid and uninterrupted work in the field.

The Contractor, by being compelled to do his work from the back fills (the filling not being completed until long after the erection had been started, and in some cases the erection finished before the filling was done), was greatly delayed and put to a large additional expense, the amount of which is hard to estimate. For a single instance, in the erection of the lower guard gates at Gatun (the fill not being far enough advanced so that the Commission could make a connection to the erection bridge when in its proper position to erect the lower guard gates), the gates had to be erected when the bridge was in position to erect the lower service gates, consequently the lower guard gates had to be erected with the miter ends pointing to the south in place of the north, and after they were partly finished had to be turned into their proper position.

The justice of the above claim was fully admitted for all three locks by the engineers of the Commission of the respective divisions when the Contractor's claim for an extension of time was discussed on the Isthmus in January, 1913, which later on resulted in the supplemental agreement establishing new contract dates.

The records of the Contractor show that the lock chambers at Pedro Miguel were flooded as follows:

May 13, 1912: Water for 3 days in the west chamber.

July 12, 1912: Water in sump holes, which caused sickness amongst the Contractor's men.

July 16 to 26, 1912: Water for 10 days in the west chamber.

July 31, 1912: Water for 3 days in the west chamber.

September 17, 1912: Five feet of water in the west chamber.

September 27, 1912: Six feet of water in both chambers.

October 23, 1912: Six feet of water in both chambers for 5 days.

November 13, 1912: Both chambers flooded for 7 days.

At Miraflores, lower level, the Contractor's record shows:

June 15 to 17, 1913: Water in east chamber.

June 15 to 21, 1913: Water in west chamber.

June 27, 1913: Water in both chambers.

August 31 to September 8, 1913: Thirteen feet in west chamber.

August 31 to September 17, 1913: East chamber flooded.

Both at Pedro Miguel and Miraflores the water backing into the chambers interfered greatly with the various operations of the Con-

tractor's work, and in numerous cases drowned and put out of working order important tools, which, after the water receded, it took quite some time to get in shape again.

The work was delayed and made more expensive also on account of the water supply of the Commission giving out at numerous times and the electric current furnished on many occasions being insufficient.

The Contractor's records of these matters are as follows:

At Pedro Miguel, up to the beginning of February, 1912, the water supply was insufficient; also November 26, 1912; and at Miraflores October 7, 1912; April 10, 1913; April 20, 1913; and May 19, 1913.

At Gatun about March 12, 1913, the Contractor was short of water for two weeks to cool the compressors, thus interfering greatly with the driving of the rivets.

The Contractor's crane No. 18, about July 3, 1911, was completely wrecked by a gravel train operated by the Commission. The crane was repaired by the Commission at the Gorgona shops, but the Contractor lost the use of it for 98 days, delaying the Contractor's work. For this time of 98 days the Contractor rendered the Commission a bill for \$1,960. The bill was not paid. The use of the crane for the 98 days it was being repaired was worth far more to the Contractor than the amount of the bill.

These numerous interruptions caused by the acts of the Commission increased the cost and delayed the work.

The bolting up of the skin or sheathing plates of the leaves was a difficult proposition, made so by the requirements of the inspectors at the shops. The specifications of the commission say that in finished work holes shall be punched one-eighth inch less than the diameter of the rivet. The rivets in general were seven-eighths inch and 1 inch diameter, making the punched holes three-fourths inch and seven-eighths inch diameter. On account of the rigid requirements of the inspectors, the Contractor was compelled, in order to get the work accepted at the shops, to punch all holes for connections to the skin plates eleven-sixteenths-inch diameter. This necessitated the bolting up to be done with five-eighths-inch bolts, making it almost an impossibility to get the work tight on account of the heavy sheathing plates.

The mere fact that it was possible to use five-eighths-inch bolts for assembling this work, which was punched with eleven-sixteenths-inch holes, shows the extreme accuracy of the punching.

On the first eight leaves manufactured—the upper guard gates at Gatun and Pedro Miguel—the holes were punched in accordance with the specifications, and for eight 77-foot leaves at Gatun they were punched very nearly so. As these gates when finished were entirely satisfactory and accepted, it shows that the requirements of punching the holes eleven-sixteenths-inch diameter was entirely useless and unnecessary.

The bolting of the heavy sheathing plates with five-eighths-inch bolts necessitated great care in the work or the nuts would be pulled off the bolts. Slow and tedious work means delay, and to overcome delays it takes lots of men. Lots of men means lots of money, and the costs pile up. At Gatun at one time there were 1,000 men doing nothing but bolting up.



Fourth. That the Commission's inspectors on the Isthmus were unreasonable in their requirements.

That they insisted upon having the work executed contrary to the spirit of a previous agreement, and also on having work done distinctly not called for in the specifications.

That they exceeded their authority by prescribing the method under which the work should be erected, and by insisting upon having this method carried out.

That on account of the inadequate shop painting and unreasonable inspection the Contractor was obliged to do unnecessary interior cleaning.

On account of the above the Contractor was seriously delayed and put to large extra expense.

We give below a statement of some of the important and unreasonable demands made by the inspectors on the Isthmus:

(a) The Contractor was obliged to cut out, redrive, and waste 1,561,000 rivets over and above the number which would customarily be cut out, redriven, and wasted on high-class bridge or structural work. As the cost of cutting out rivets is greater than driving them, and the cost of redriving these rivets is very much greater than the original cost of driving, it is readily seen that the delay and additional cost from this source was enormous.

(b) The nickel-steel bearing plates had been ground at the shops with the utmost precision to a practically perfect alignment. The specifications are entirely clear as to the method that should be pursued to adjust the same in the field, no grinding being called for whatever. Contrary to these requirements, we had to grind them in the field, so that feelers four one-thousandths of an inch in thickness could not be inserted between these plates when the gates were closed, although no such limitation was established on the plans or in the specifications. This again caused additional delay and expense.

(c) As it was proven that the planing of the ends of the leaves was not feasible and not necessary this planing had been waived, with the proviso that the end reaction castings be made in one-story height against two-story heights called for and that any high spots caused by the riveting on these end plates in the shop or in the field be removed by grinding. A heavy canvas water stop was also provided between the end reaction castings and the end plates. The omission of the end planing was the main saving the Contractor counted on when he agreed to absorb a good deal of additional expense he had to incur on account of the necessary changes. Contrary to the spirit of this agreement, he had to grind the end plates to perfect planes in the field, causing a tremendous expense and delay.

(d) The inspectors at Gatun and Pedro Miguel insisted on directing the order and methods of the successive steps of erection, thus delaying the progress and increasing the cost. At Miraflores the erection was carried on according to the Contractor's own methods.

(e) On account of the inefficiency of the single shop coat of paint and the unreasonable demands of the inspectors on the Isthmus the Contractor was required to clean the inside of the leaves before the bitumastic enamel was applied in a manner not contemplated by the specifications or demanded by the paint contractor.

No difference can be shown between the specifications for high-grade bridge work now being constructed in this country and the specifications for the lock gates as regards field work, but when a comparison is made between the actual field requirements for high-grade structural or bridge work and the requirements for the lock gates as enforced at the Isthmus a great difference is apparent.

One of the big jobs in connection with the erection of the canal gates on the Isthmus was the driving of rivets—about 5,730,000 being required in the work. In high-grade bridge work constructed by the Contractor, like the cantilever bridge for the Pittsburgh & Lake Erie Railroad over the Ohio River at Beaver, Pa., amounting to about 16,000 tons of structural steel, and the Winner Bridge over the Missouri River at Kansas City, Mo., requiring about 18,000 tons of

structural steel, the rejections by the inspectors of the number of rivets driven compared with that of the lock gates shows a very high degree of refinement in the requirements for the lock gates—almost beyond conception as compared with bridge work.

The condemnation of the number of rivets driven in the field for the cantilever bridge over the Ohio River at Beaver was about  $2\frac{1}{2}$  per cent of the total number driven, and in the Winner Bridge at Kansas City over the Missouri River about  $3\frac{1}{4}$  per cent of the total number of rivets driven.

Under the most severe inspection on high-grade bridge work Contractors in estimating consider that the rejections will never run over 5 per cent. Never are more than 10 per cent excess field rivets provided in any contract to cover both rejections and losses, and a liberal portion of these rivets are as a rule returned to the shop. For the lock gates there were actually used up over 7,865,000 field rivets, an excess of over 2,135,000 filed rivets, or about 37.25 per cent over and above the 5,730,000 rivets that actually were required for the finished leaves—an appalling proposition to the Contractor who had to do the work.

Mr. J. O. Childers, general superintendent for the Contractor on the Isthmus, from about September 1, 1912, to the finish of the work, and who also had charge of the erection of the cantilever bridge at Beaver, Pa., and the Winner Bridge over the Missouri River at Kansas City, both previously referred to, in a signed statement says:

The inspection on riveting at Gatun, and to a certain extent at Pedro Miguel, was the most rigid I ever experienced. In other words, on first inspection, nothing but a perfect rivet would be passed. Hundreds of thousands of rivets were cut out which would have answered every requirement on any other job. In many cases good rivets were cut out and redriven so often that the plates were damaged, and the rivets finally accepted were inferior to those first driven.

Mr. Charles Welker, superintendent at Pedro Miguel, for the Contractor, states:

Riveting was much higher (meaning cost) on account of inspection. A rivet out of line one-fourth inch had to be cut out, or one that had been marked with a maul in cutting out others; or one that had a trifle too much stock, or if the inspector imagined he felt a jar, he would not pass it. In cutting out the rivets it bends and jars the iron and loosens other good rivets around them, which finally had to come out and be redriven. If in reaming the holes (outside and inside these did not match) or if it left a hole a little out of round in the outside sheathing which could easily be filled with a rivet, it would not be passed. The hole had to be drilled out to a perfect hole and a large rivet used to fill the hole. In some cases it was necessary to have the blacksmith make a rivet large enough to fill such holes. The inspection was just as stiff above the water-tight compartments as below.

Mr. Grant Courter, for a while superintendent for the Contractor at Pedro Miguel, states:

On account of the severe inspection of the rivets by the inspectors, who in my opinion were prejudiced against the negroes, and cut out rivets that were positively good, in order to make our company put on all white shipyard riveters, we were compelled to keep a force of men cutting out rivets all the time, which made the rivets cost 30 cents apiece, instead of from 5 to 7 cents, as on all high-class structural work.

The grinding of the end plates before the reaction castings were placed on the leaves was work where the requirements of the inspectors were very severe. On page 31 reference is made to a report of the chief inspector to Mr. Hammer, stating that the requirements of



the specification to plane these plates in the field was waived altogether if a satisfactory job was made of the work in the shop. What motive could be back of such action to make the Contractor make these plates perfect in the shop under the most rigid inspection, in order that the planing in the field be waived, and then after the work was erected require the Contractor to spend an enormous sum in grinding these plates until they looked like mirrors?

Mr. J. O. Childers, general superintendent for the Contractor on the Isthmus, in a signed statement with reference to grinding, says:

I am confident that the same results could have been obtained with 75 per cent less grinding than was done. One instance of the inspection of this part of the work I will cite. The quoin end of leaf No. 12, our master mechanic continually complained about the unnecessary grinding required by the inspectors. I instructed him to grind this particular end of leaf No. 12 to what he considered a first-class job, and if the inspectors refused to pass it, to notify me. The inspector was called and inspected seven panels, condemning five and refused to inspect the other nine, claiming that the work was absolutely rotten. After inspecting the work myself and finding it practically perfect, I notified Mr. Dumville, head inspector for the Commission at Gatun, who then inspected and passed the entire end with the exception of one small spot, which required 10 minutes grinding.

This is another illustration, previously referred to under shop inspection, of the apparent indifference of the inspectors to pass anything, no matter how carefully and thoroughly the work had been done.

There can be no question that the requirements of the field inspection were for far superior workmanship than high-grade bridge or ship work, remembering that these great doors or leaves, some of them 82 feet in height and weighing 750 tons each, were made to close with all the accuracy of the lids of a watch case, and yet a watch case is not waterproof, but these gates are waterproof with respect to the bearings at the miter and quoin ends, remembering also that these bearings were so true to their full height of 82 feet that when the leaves were closed by hand, and not with the pressure of a lock full of water back of them, that an inspector could not insert a narrow metal gauge of the thickness of four one-thousandths of an inch in the full height at the miter and quoin ends or at the sills at the bottom. If he could do so at any point, the work was rejected, and then, considering that the Commission says that for machine-shop work referred to in circular 636 for rising-stem gate valves, that they want the work made to an accuracy of plus or minus one sixty-fourth of an inch, and here in the lock gates the accuracy insisted upon by the inspectors for the bearings at the miter and quoin ends and the sills at the bottom is the accuracy of one-fourth of one sixty-fourth of an inch. Is not then the lock-gate construction a far finer grade of machine-shop work than the manufacture of the rising-stem gate valves? The marvel of it all is that the gates were ever finished under such inspection.

With reference to this field inspection, there is given in full, without comment, a letter of Mr. E. K. Morse, well-known engineer of Pittsburgh:

PITTSBURGH, PA., *March 5, 1914.*

Mr. H. H. McClintic,

*McClintic-Marshall Construction Co., Hotel Raleigh, Washington, D. C.*

DEAR SIR: You telephoned me this afternoon asking that I immediately write you a short note containing a few of the observations I made of the steelwork in the locks and dams of the Panama Canal, for which you were the Contractor.



I spent seven days in the canal during the month of March, 1912, bunking in the Y. M. C. A.'s and messing with the men, living the life they did and dressing as they dressed. My object in so doing was to obtain direct information and experiences of the laboring classes and mechanics—first-hand information. By sacredly refraining from asking any of the men his name, residence, history, or anything of like nature, I soon disarmed any suspicion of a gum-shoe man, and the information that I received was of so confidential a character that I have, as you well know, refrained from publishing or giving any expression of the information that I received. In fact, it was only two weeks ago that you ever heard me express myself regarding your own construction. I will now cite two cases which will illustrate clearly the character of the field work that you were compelled to do.

The first instance is a case of grinding the miter plates of the lock gates to a perfect bearing. The inspector in charge of the case I have in mind had a steel straightedge which he kept placing on the face that was being polished in every angle of the circle, and if the contact between the plate and the straightedge was not absolutely perfect the polishing was continued. It has continued for 42 days on one plate, up to and including the day that I was examining same, and was far from being complete. That evening I met the designer of the gate at the Y. M. C. A. at Culebra and asked him this one question: "What would be the amount of warp in the depth of the gate with the sun shining on one side and a shadow on the other?" This condition obtained every clear day and for hours during the day. His reply was—seven-eighths of an inch out of line. In other words, that same plate which the inspector was having polished to an absolutely true line, and had spent 42 days doing it—and so far as I could see was not over half done at the time I was examining the plate and getting this information direct—would warp seven-eighths of an inch. That is, every sunrise to noontime, or not later than 2 o'clock, at that specific point that I have in mind, that plate would warp out of line seven-eighths of an inch.

At another gate I stood for a while watching an inspector have rivets 6 inches long cut off and backed out by a riveting gang because the heads of the rivets were slightly eccentric. I said to him, "Are you not doing more damage to the plates by having that rivet cut out than you will accomplish good by having a new one driven?" He turned on me fiercely and said that McClintic-Marshall had gone over the heads of the inspectors trying to make it hot for them and to wait until they got ready to calk the rivets in the gate and he would give them a piece of inspection that would teach them a lesson, that he had come from a \* \* \* shipbuilding plant where they knew how to work and there was not a \* \* \* riveter on the job that knew anything about driving or calking a ship rivet \* \* \* and that when the time came he would teach them what inspection was and that there was a hot time ahead. It is needless to say that this made my blood boil, because it recalled the experience that Ryland and I had in the erection of the Hawkesbury River Bridge in Australia in 1887, 1888, and 1889, when we complained to Sir Benjamin Baker and Sir John Fowler in London. Our right to a claim was not anything like as just as yours. Every item of our estimate of unnecessary cost was allowed us by these English engineers, and if you get anything like as fair treatment from the United States Government as Ryland and I got from the English Government, my short experience in the canal leads me to believe that yours is not only just but extremely large in magnitude.

I have spent all my life since 1874 as a laborer in my brother's bridge works, 15 years of my life as erector and contractor for same, and the balance of the time as a consulting engineer in the designing and construction of bridges, so that it is needless to say that much of my time was spent in and around the locks of the Panama Canal and my observations and conclusions are correct.

Respectfully, yours,

E. K. MORSE,  
*Member American Society Civil Engineers.*

When Mr. Wolfel was on the Isthmus during January, 1913, the large number of rivets which were being cut out was discussed. During the discussion it developed that the reason for cutting out a large percentage of the rivets was that the heads were not in perfect alignment, also referred to in letter of Mr. Morse and Supt. Welker quoted above. In discussing this matter with Mr. Goldmark he gave his reason that on all such rivets the heads in all probability



were not concentric with the shaft, but it was pointed out to him that on account of the nature of the work (subpunched and field reamed) the holes might be slightly out of line. A test case was made where the inspector condemned a number of rivets for no other reason than being out of line. The heads of 17 of the worst of these rivets were cut off on the inside of the leaf and then were backed out of the hole, leaving the made head or the head to which the objection had been raised attached to the shank of the rivets. These rivets were then submitted to Mr. Goldmark, and he was shown that 50 per cent of the rivets were perfect, of the remainder 25 per cent were somewhat eccentric but not enough to warrant condemnation, and the remaining 25 per cent were questionable.

That the inspectors exceeded their authority by prescribing the method under which the work should be erected, and by insisting upon having this method carried out, is best brought out by two reports of Mr. J. O. Childers, general superintendent for the Contractor on the Isthmus, who states as follows:

On taking charge in August, 1912, I found that the inspectors employed by the Isthmian Canal Commission were practically in charge of and dictating the method of erection.

The method of erection at that time was to place the first five or six girders and then plumb them up, which in many cases consumed considerable time, and from that time plumbing up was required after placing one or two girders; and as the leaf was continually changed as weight was added (to it), the plumbing done was completely lost the next time more weight was added. We consumed as much as five days in this useless plumbing on one set of leaves. In many instances the raising and yard gangs were tied up with nothing to do while this plumbing was being done.

After thoroughly going over these details and the construction of the leaves, I evolved a scheme of erection which meant the elimination of that needless plumbing up, but Mr. Dumville, the head inspector at Gatun, would not consent for us to try out this scheme; and as we were in no condition to make a fight at the time, I was forced to submit and allow erection to proceed in the old manner. On an average six days were required in which to erect the skeletons of two leaves at Gatun.

The erection not having been started at Miraflores when I took charge, the plan of erection was taken up with Mr. Howe, the head inspector at that place, and after some time he agreed that the first four leaves should be erected in accordance with my plan.

This plan was employed in the erection of all the work at Miraflores, with the result that two leaves were erected in less than one day, or 36 girders placed in eight hours. We found that after the erection of these leaves in this manner they were plumbed in less than a day's time.

On another occasion Mr. Childers states about this:

At Gatun our raising gang was considerably handicapped by the inspectors demanding that the steel be erected according to their idea as to how it should be erected. I should judge that the cost of the erection at Gatun was increased at least 50 per cent by the interference of inspectors. At Pedro Miguel the erection was practically completed when I took charge. We were not interfered with by the inspectors at Miraflores.

It will be seen from this that these occurrences were confined to Gatun and Pedro Miguel, which is typical, as the actions of the inspectors at these sites were unreasonable beyond conception, while Mr. Howe at Miraflores gave us all help possible, except that he, too, had to live up to the unreasonable requirements as to riveting, grinding, etc., although he did this in a much lesser degree than was done at the other two sites.

The unnecessary cleaning of the interior of the leaves was another item of large expense to the Contractor.

Owing to climatic conditions and to the kind of paint which was applied to the material on the inside of the leaves at the shop, there was considerable rust formed during the period of erection, which largely increased the amount of cleaning on the inside of the leaves before enameling.

From the time this work started at Gatun the Contractor's men in charge continually complained of the inspectors. This matter was taken up repeatedly with Mr. Guynn and Mr. Dumville, but the Contractor was unable to get any relief, and the inspection continued to grow so much more rigid on this part of the work that it was well-nigh impossible to get a leaf passed.

After leaf No. 6 had been rejected with the statement that if the Contractor would give it two more days' cleaning they would again inspect it, the superintendent of the Contractor in charge at once inspected the part of the leaf rejected and found it clean. He ordered all men out of the leaf and asked Mr. Dumville to accept the leaf and not allow the man who had condemned it to do any more inspecting; otherwise he would demand an investigation. Mr. Dumville refused this request. The matter was taken up with the chairman, and Col. Dixon was appointed to inspect the leaf and report to the chairman. The inspection was made and the leaf accepted with little or not additional cleaning.

The method of inspecting the leaves for inside cleaning was to rub the hand over the surface and if it became soiled the leaf was rejected.

The expense incurred by the Contractor for cleaning the interior of these leaves is as follows:

Miraflores, 28 leaves, \$17,551, or \$627 per leaf.

Pedro Miguel, 24 leaves, \$14,883, or \$621 per leaf.

Gatun, 40 leaves, \$77,269, or \$1,932 per leaf.

This bears out above statement about the kind of cleaning the Contractor had to do at Gatun, and incidentally bears out the previous statement as to the severeness of the Gatun inspection.

A large part of the cleaning in the first place was caused by the bitumastic paint called for in the specifications being inadequate to meet the climatic conditions at the Isthmus. This is borne out by correspondence with Mr. Jewel, also by Mr. Hammer's letter of June 1, 1911, in which he states: -

Referring to lock-gate material received on the Isthmus, I beg to call your attention to some serious trouble found with material painted with bitumastic solution:

I have been informed in telegram of this date that large rust spots have occurred within a few weeks after unloading the material on the Isthmus. The bitumastic solution used for the shop coat is therefore considered unsatisfactory, and no more bitumastic solution must be used on material before the matter has been investigated.

This is further borne out by a supplemental agreement entered into December 6, 1911, between the Commission and the Contractor, in which the Commission agrees to pay the Contractor \$158,120 to change the bitumastic paint on the interior of the leaves originally specified to bitumastic enamel. The Contractor is sure that on account of the inefficiency of the paint called for, even at Miraflores and Pedro Miguel, the cost for this interior cleaning was at least



doubled, while at Gatun of course the Contractor had a big additional waste of money, pure and simple, due to the over-exacting conditions imposed upon the Contractor by the inspectors.

Fifth. That taking into account the extension of time to which the Contractor was entitled on account of the delays caused by the Commission, he was required to and did complete the work in a much shorter time than that provided for in the contract.

That in order to meet these requirements of the Commission the Contractor had to resort to a large amount of rush work, which again caused enormously increased costs in the field.

That even if the delays previously described had not occurred much of this expensive rush work would have been necessary on the leaves at Pedro Miguel and Miraflores, as the masonry for these leaves was very much behind the dates established in the contract, making the time available for the erection of these leaves too short for carrying on the field operations in an economical way, when the kind of work that had to be done in the field is taken into consideration.

It will be noted that serious delays occurred. A claim for extension of time was made by the Contractor, under date of December 7, 1912, modified, after further investigation at the Isthmus, by letter to Mr. Goldmark, under date of January 18, 1913. As a result of this claim, a supplemental agreement was entered into, under date of May 20, 1913, between the Commission and the Contractor, establishing new contract dates under which the gates had to be finished so that water could be turned into the canal and the gates operated. The vital dates of this agreement are: October 1, 1913, being the date of completion for all guard gates and all other gates on one side of the canal; and March 1, 1914, being the date of completion for the balance of the work. It is still claimed by the Contractor that the dates established in his letter of January 18, 1913, were reasonable and fair. In accordance with this letter the last gates need not have been completed until April 8, 1914. It should be stated here, however, that in arriving at the dates given in this letter of January 18, 1913, the Contractor made no allowance and put in no claim for the time required to do the additional work not called for or contemplated under the contract. It has been shown that such work had to be done, causing great extra expense. This being established, it naturally follows that such extra work also takes time, and that work like bolting up with small holes, cleaning to a polish, etc., takes lots of time. Therefore, considerable time should be added to the dates established in the Contractor's letter of January 18, 1913, making the fair date for completion much later than April 8, 1914.

For reasons best known to the Commission, the Contractor was urged to use every effort and spare no expense to complete the work covered by this contract as soon as possible.

As a matter of fact, the dates of the supplemental agreement were actually anticipated by the Contractor, the work called for to be finished by October 1, 1913, and March 1, 1914, being finished by September 24, 1913, and January 26, 1914, respectively.

This, however, could only be accomplished by an immense amount of overtime and rush work at a very large expense to the Contractor, and for this expense the Contractor claims that he is fairly and justly entitled to proper compensation.

The masonry for the gates at Pedro Miguel and Miraflores was delayed beyond the dates established in the contract as follows:

- Leaves 50 to 57, Pedro Miguel, 3½ months.
- Leaves 58 to 61, Pedro Miguel, 4 months.
- Leaves 62 to 73, Pedro Miguel, 8 months.
- Leaves 100 to 107, Miraflores, 4 months.
- Leaves 108 to 111, Miraflores, no information.
- Leaves 112 to 115, Miraflores, 3 months.
- Leaves 116 to 119, Miraflores, 6 months.

For leaves 120 to 127 at Miraflores, the masonry for which should have been completed by November 1, 1912, the masonry was not finished on January 20, 1913, but was expected to be finished soon thereafter.

Sixth. That the Contractor has not received adequate compensation for the water stops that had to be used to make the work water-tight, although not called for on the plans or in the specifications.

Water stops were not called for in the specifications and their use vigorously opposed by Mr. Goldmark. Later on it developed that they had to be used to make the work water-tight. For the plain material for these water stops the Contractor paid \$7,560. For these stops, soaked in red lead and linseed oil, erected in place, the Commission paid the Contractor \$222.25. This payment was made on the strength of paragraph 5, page 7, I. C. C. 576, which reads:

Rubber gaskets and all packing in items 4 and 10 will be paid for at the same rate per pound as the metallic parts in the items in question.

This clearly does not apply to the water stops.

*Amount of claims.*

1. Extra cost of working drawings, due to delay in furnishing complete designs and data, to changes made, and to delay in the approval of working drawings-----	\$8, 890. 00
2. Increased cost of fabrication due to delay in furnishing the Contractor the necessary data, unfair demands of the Commission's engineers, and unreasonable shop inspection-----	320, 892. 00
3. Material rejected or put in stock on account of unreasonable inspection -----	48, 621. 00
4. Extra cost of water stops, soaked in red lead and linseed oil, put in place-----	21, 094. 75
5. Loss on shop output, due to delays, unfair demands of the Commission's engineers, and unreasonable inspection-----	123, 660. 00
6. Extra cost of erection due to conditions imposed upon the Contractor contrary to the contract requirements, also to conditions that caused extra expense, which should be borne by the Commission, to unreasonable inspection in the field, and to the necessity of completing the work within the time demanded, in spite of numerous delays caused by the Commission and the extra work necessary on account of the conditions mentioned above and unreasonable inspection-----	1, 218, 475. 00
7. Extra cost of erection outfit required to complete the work within the time demanded-----	200, 000. 00
Total-----	1, 941, 632. 75

The amount of claims are arrived at as follows:

1. Extra cost of working drawings, due to delay in furnishing complete designs and data, due to changes made and due to delay in the approval of working drawings, \$8,890.

This amount is the difference between the actual cost of these working drawings and a careful estimate of what the drawings



actually furnished for the work should have cost had the design been complete, had no changes been made and had the drawings been approved promptly.

2. Increased cost of fabrication due to delay in furnishing the Contractor the necessary data, unfair demands of the Commission's engineers, and unreasonable shop inspection, \$320,892.

This amount is the difference between the actual cost of this work and what it should have cost under reasonable demands and inspection. The shop labor and surcharge on the lock gates was over \$4 per ton higher than the average cost of all the work turned out in the same shop for the year preceding and the year succeeding the fabrication of the lock gates. This work should have been done at about \$2 per ton less than the average cost of all the work for the preceding and succeeding years for the reason that there was so much duplication in the work and such a large proportion of work simply punched and drilled without being assembled or riveted. This difference in cost of \$6 per ton is borne out by a careful estimate of the work based on the Contractor's established piecework rates for the different classes of work and the further fact that the shop labor and surcharge for these gates was over \$6 per ton higher than for high-grade bridge work turned out by the contractor during this period; for example, the truss spans of the Winner Bridge at Kansas City, the truss spans on the New York connecting work—both of which are the highest class work.

The loss from the unreasonable demands of the engineers and inspectors is 53,482 tons at \$6 per ton=\$320,892.

3. Material rejected or put in stock on account of unreasonable inspection, \$48,621.

This amount is made up as follows:

600,000 pounds, at \$2.75-----	\$16, 500
Excess rivets cut out, 1,458,000 rivets, or 1,267,000 pounds, at \$2.45--	31, 041
Bolt material put in stock, 90 tons, at \$12-----	1, 080
Total-----	48, 621

4. Extra cost of water stops, soaked in red lead and linseed oil, put in place, \$21,094.75.

The canvas, paint, and labor for these water stops cost:

Canvas -----	\$7, 564. 00
Red lead-----	5, 580. 00
Placing -----	8, 928. 00
Total-----	22, 072. 00
Used for other purposes (see Exhibit S3, Wolfel) -----	\$755. 00
Amount paid contractor-----	222. 25
	977. 25

The Contractor has been allowed payment on the nominal number of yards of water stops called for on detail drawings at the rate governing for item No. 1 of contract, or for 5,872 pounds, at \$3.785 per hundred pounds, a total of \$222.25. Considerable more canvas was actually used than called for by the detail drawings.

The amount due the Contractor is the difference between \$22,072 and \$222.25=\$21,094.75.

5. Loss on shop output due to delays, unfair demands of the Commission's engineers, and unreasonable inspection, \$123,660.

On page 72 we give table showing output of shop No. 2, the shop in which the lock gates were fabricated, for the year preceding and the year succeeding the period of 26 months, during which time the lock gates were manufactured. From this table it will be noted that the average monthly output of the shop for the year preceding and the year succeeding the manufacture of these gates was 3,451 tons, while the average monthly output of the shop for the 26 months during the fabrication of these gates was 2,562 tons, a loss of 889 tons per month. The total loss in output of the shop for the 26 months was 26 times 889 tons=23,114 tons.

By an inspection of the table it will be seen that the output of the shop began to drop immediately after the manufacture of these gates was started in November, 1910, dropping from 3,724 tons in November, 1910, to 2,631 tons in December, 1910, and still further to 2,098 tons in January, 1911, 1,132 tons in February, 1911, and 1,290 tons in March, 1911. This loss in output was entirely due to the unreasonable inspection and conditions imposed upon the Contractor by the Commission's engineers and inspectors.

The average profit made on the entire tonnage turned out by the Contractor for the year preceding the lock-gate work and for the year succeeding the lock-gate fabrication was approximately \$5.35 per ton. Consequently, the resultant loss on the reduced output due to the unfair demands of the Commission's engineers and the unreasonable inspection was 23,114 tons, at \$5.35 per ton, or \$123,660.

Output shop No. 2 during lock-gate fabrication:		Output shop No. 2 for preceding and succeeding year:	
	Tons.		Tons.
December, 1910 -----	2, 631	December, 1909 -----	3, 108
January, 1911 -----	2, 098	January, 1910 -----	3, 935
February, 1911 -----	1, 132	February, 1910 -----	3, 072
March, 1911 -----	1, 290	March, 1910 -----	3, 329
April, 1911 -----	2, 173	April, 1910 -----	3, 909
May, 1911 -----	2, 181	May, 1910 -----	3, 413
June, 1912 -----	2, 601	June, 1910 -----	3, 922
July, 1911 -----	3, 106	July, 1910 -----	3, 601
August, 1911 -----	3, 554	August, 1910 -----	4, 612
September, 1911 -----	3, 501	September, 1910 -----	4, 214
October, 1911 -----	2, 569	October, 1910 -----	3, 580
November, 1911 -----	2, 549	November, 1910 -----	3, 724
December, 1911 -----	2, 017	February, 1913 -----	2, 702
January, 1912 -----	2, 711	March, 1913 -----	2, 818
February, 1912 -----	2, 543	April, 1913 -----	2, 751
March, 1912 -----	2, 840	May, 1913 -----	2, 728
April, 1912 -----	2, 607	June, 1913 -----	3, 405
May, 1912 -----	3, 003	July, 1913 -----	3, 404
June, 1912 -----	2, 601	August, 1913 -----	3, 167
July, 1912 -----	2, 679	September, 1913 -----	3, 332
August, 1912 -----	2, 716	October, 1913 -----	4, 073
September, 1912 -----	2, 488	November, 1913 -----	3, 003
October, 1912 -----	3, 047	December, 1913 -----	3, 931
November, 1912 -----	2, 963	January, 1914 -----	3, 103
December, 1912 -----	2, 340		
January, 1913 -----	2, 200		
Total for 26 months ---- 66, 621		Total for 24 months ---- 82, 836	
Average output during lock-gate fabrication, 2,562 tons.		Average monthly output for preceding and succeeding months, 3,451 tons.	



6. Extra cost of erection due to conditions imposed upon the Contractor contrary to the contract requirements, also to conditions that caused extra expense, which should be borne by the Commission, to unreasonable inspection in the field, and to the necessity of completing the work within the time demanded in spite of delays caused by the Commission, and the extra work necessary on account of the conditions mentioned above and unreasonable inspection, \$1,218,475.

The tonnage furnished and erected, the erection cost incurred at the Isthmus, and the corresponding rate per ton at the three sites are as follows:

Location.	Tonnage.	Total cost	Cost per ton.
Gatun.....	25,498	\$1,372,641	\$53.83
Pedro Miguel.....	14,924	886,107	59.37
Miraflores.....	17,752	911,259	51.32
Total.....	58,174	3,170,007	54.50

To this should be added transportation, liability, and general expense incurred at the Isthmus, amounting to \$391,891, giving a total of \$3,561,898, or \$61.20 per ton.

This amount is exclusive of erection equipment furnished from the States.

The wide divergence in the cost per ton at the three sites is explained as follows:

While at Miraflores there was some trouble about the yards and tracks (claim 11 days),<sup>1</sup> this trouble was a great deal worse at Gatun (claim 50 to 75 days), and by far worse at Pedro Miguel (claim 40 to 100 days).

The inspection at Gatun and Pedro Miguel was much more severe than at Miraflores, as has been proven by the interference of the inspectors with the Contractor's erection method, by the cost of the cleaning of the interior of the leaves at the three sites, and as will be shown by the amount of the excess riveting.

Serious delay and expense was incurred at Pedro Miguel on account of water in the chambers (claim 30 days). This claim was admitted by Mr. Goldmark to be, if anything, too low, and the Contractor is satisfied from further investigation at the Isthmus that it was very much too low.

Some similar delay occurred at Miraflores (although not nearly as aggravated) as at Pedro Miguel.

For all these reasons given the costs at Gatun and Pedro Miguel would naturally be higher than at Miraflores. The extent, however, to which these causes increased the erection expense is hard to establish. On the other hand, the erection cost at Miraflores was increased on account of the very expensive rush work necessary at this site. This amount, however (as will be shown later), establishes itself from the erection costs of the different sets of leaves at Miraflores. For these reasons a normal erection cost will be established for the leaves at Miraflores by deducting from the actual cost the amounts for which the Contractor holds the Commission responsible.

<sup>1</sup> This refers to the number of days claimed in the Contractor's letter of Jan. 18, 1913, as the extension of time due him on account of delays caused by the Commission.

Total erection expense incurred at Miraflores----- \$911, 259

From this should be deducted, for reasons given below, the following amounts for which the Contractor holds the Commission responsible:

(a) Condition of yards and tracks-----	\$6, 753
(b) Bolting up with small holes, 37.8 per cent of \$153,303-----	57, 950
(c) Reaming out the small holes, one-fourth of \$53,070-----	13, 270
(d) Water in lock chambers-----	5, 000
(e) Excess riveting, \$46,850 plus \$58,358 divided by two-----	52, 600
(f) Excess grinding, three-fourths of one-third of \$119,900--	29, 966
(g) Excess cleaning, one-half of \$14,856-----	7, 428
(h) Rush work, 17,752 tons at \$8 per ton-----	42, 000
	<hr/> 314, 967

Total normal expense----- <sup>1</sup> 596, 292

The Contractor therefore claims that he could have erected these leaves if the Commission's actions had not interfered with his work for \$33.49 per ton.

The explanation for the amounts given above are as follows:

(a) *Condition of yards and tracks.*—In his letter of January 18, 1913, the Contractor claimed that he had been delayed on account of the condition of these yards and tracks by 11 days. Mr. Cole, division engineer, and Mr. Goldmark, both admitted the justice of a claim for this delay, but were inclined to somewhat reduce the number of days. Taking into account our pay rolls at Miraflores the Contractor claims that he has been put to an expense of at least \$6,753 on this account.

(b) *Bolting up with small holes.*—The Contractor claims that on account of the small holes he was forced to use, the expense of bolting up on the part of the leaves where 1-inch rivets are used was two and one-half times as great as it should have been, and on the part of the leaves where seven-eighths-inch rivets are used at least one and one-fourth times as great as it should have been. In the skin of one 77-foot leaf are used approximately 18,000 1-inch rivets, and 45,000 seven-eighths-inch rivets—a proportion of 2 to 5. It therefore follows that if the expense of bolting up with the larger holes would have been 7, this expense was increased by the use of small holes to 2 by 2½ equals 5, 5 by 1¼ equals 6.25; total, 11.25.

The normal expense should therefore have been 62.2 per cent of the actual expense the Contractor had to incur, or the Commission should pay the Contractor 37.8 per cent of the actual cost of \$153,303, or \$57,950. This would reduce the cost of bolting up from \$8.64 per ton to about \$5.36 per ton.

(c) *Reaming out the small holes.*—Based on the same proportion of different-sized holes of 2 to 5 given under (b) the explanation for this is as follows:

The metal we should have reamed out if the specifications had been followed for the holes for the 1-inch rivets and seven-eighths-inch rivets are as follows:

	Square inch.		Square inch.
1 <sup>1</sup> / <sub>16</sub> -inch holes, area-----	0. 8866	1 <sup>5</sup> / <sub>16</sub> -inch holes, area-----	0. 6903
7/8-inch holes, area-----	. 6013	3/4-inch holes, area-----	. 4418
	<hr/> . 2853		<hr/> . 2485

<sup>1</sup> Items a, b, c, e, f, and g have been reduced in the proportion of 43.32 to 51.32 to eliminate the effect of the rush work.



The metal actually reamed out, however, is:

	Square inch.		Square inch.
1 $\frac{1}{8}$ -inch holes, area-----	0. 8866	1 $\frac{5}{8}$ -inch holes, area-----	0. 6903
1 $\frac{1}{2}$ -inch holes, area-----	. 3712	1 $\frac{1}{2}$ -inch holes, area-----	. 3712
	<hr/>		<hr/>
	. 5154		. 3191

Therefore the proportion of the excess reaming to the normal reaming can be established.

Normal reaming 2 by 0.2853 equals 0.5706; 5 by 0.2485 equals 1.2425; 1.8131.

Actual reaming 2 by 0.5154 equals 1.0308; 5 by 0.3191 equals 1.5955; 2.6263.

This shows that the Contractor actually reamed in the field 45 per cent more than he should have reamed under the specifications, or that 31 per cent of the reaming that was done in the field was in excess of the specifications. Making allowance for the time consumed in moving the tools from one hole to the other, the Contractor therefore claims that the should be compensated for the one-quarter of the total cost of this field reaming of \$53,070 or \$13,270.

(d) *Water in lock chambers.*—While this amount is hard to establish, we claim on account of the number of days established under claim No. 3 at a conservative estimate, \$5,000 for this obstruction.

(e) *Excess riveting.*—In the finished leaves are 5,730,000 rivets that have been driven in the field. To do this the Contractor has used up at the Isthmus 7,762,000 rivets—an excess of 35.46 per cent. Four per cent, or 230,000 rivets, will be allowed for rivets burned or lost, and 6 per cent, or 344,000 rivets, conceded for rivets cut out under normal inspection. On the basis given above, 10 per cent are conceded as a normal loss, which is the total excess rivets shipped on all bridge contracts, of which excess, however, as a rule a liberal portion is returned to the works.

It is a well-established fact that it costs over one and one-half times to two times as much to cut out a rivet than it costs to drive it originally, and that the redriving of the cut-out rivets costs about the same as the cutting out.

Based on these assumptions, and on the actual cost of riveting at the three sites, the following table has been prepared in which Table X represents the cost of the original driving.

CUTTING OUT AND REDRIVING=3 X. COST OF ORIGINAL DRIVING, X=5.89 CENTS PER RIVET.

Location.	Net number of field rivets re-quired.	Cost of riveting.						Field rivets cut out.			
		Actual.		Normal.		Excess.		Total.		Excess.	
		Total.	Cents per rivet.	Total.	Cents per rivet.	Total.	Per cent.	Number.	Per cent.	Number.	Per cent.
Gatun.....	2, 508, 000	\$313, 000	12. 48	\$174, 300	6. 95	\$138, 700	79. 5	934, 600	37. 2	784, 000	31. 2
Pedro Miguel....	1, 476, 000	175, 000	11. 86	102, 600	6. 95	72, 400	70. 5	497, 600	33. 8	409, 000	27. 8
Miraflores.....	1, 746, 000	168, 150	9. 63	121, 300	6. 95	46, 850	38. 6	369, 800	21. 2	265, 000	15. 2
Total.....	5, 730, 000	656, 150	11. 45	398, 200	6. 95	257, 950	64. 8	1, 802, 000	31. 4	1, 458, 000	25. 4

CUTTING OUT AND REDRIVING=4 X. COST OF ORIGINAL DRIVING, X=5.07 CENTS PER RIVET.

Gatun.....	2, 508, 000	\$313, 000	12. 48	\$157, 800	6. 29	\$155, 200	98. 5	915, 600	36. 5	765, 000	30. 5
Pedro Miguel....	1, 476, 000	175, 000	11. 86	92, 800	6. 29	82, 200	88. 8	493, 600	33. 4	405, 000	27. 4
Miraflores.....	1, 746, 000	168, 150	9. 63	109, 800	6. 29	58, 350	53. 1	392, 800	22. 6	288, 000	16. 6
Total.....	5, 730, 000	656, 150	11. 45	360, 400	6. 29	295, 750	81. 9	1, 802, 000	31. 4	1, 458, 000	25. 4

From this table will be seen that the actual cost of a finished rivet in the leaf is:

	Cents.
At Miraflores-----	9. 63
At Pedro Miguel-----	11. 86
At Gatun-----	12. 48
Average-----	11. 45

That there were cut out at Miraflores from 369,800 to 392,800 rivets, or from 21.2 to 22.6 per cent.

At Pedro Miguel from 493,600 to 497,600 rivets, or from 33.4 to 33.8 per cent.

At Gatun from 915,600 to 934,600 rivets, or from 36.5 to 37.2 per cent.

A total cut out of 1,802,000 rivets, or 31.4 per cent.

That the excess cut-out over the 6 per cent permissible under normal inspection was: at Milaflores, from 15.2 to 16.6 per cent; at Pedro Miguel, from 27.4 to 29.2 per cent; at Gatun, from 30.5 to 31.2 per cent; or an average of 25.4 per cent.

That the money the Contractor had to spend over and above what he should have spent under normal inspection amounted to, \$46,850 to \$58,350, or 38.6 to 53.1 per cent at Miraflores; \$72,400 to \$82,200, or 70.5 to 88.8 per cent at Pedro Miguel; \$138,700 to \$155,200, or 79.5 to 98.5 per cent at Gatun.

These percentages are based on the amount that should have been spent under normal inspection (100 per cent.)

The Contractor claims that this riveting could and should have been done for from \$360,400 to \$398,200, while it actually cost him \$656,150, an excess from \$257,950 to \$295,750, or 64.8 to 81.9 per cent, and that this large extra expense is due to the extreme and unreasonable inspection under which the Contractor had to execute this contract.

The Contractor draws special attention to the comparative showing of the costs and the number of rivets cut out at the three lock sites, which is a clear indication of the degree of unreasonableness of the inspection at the three sites.

The Contractor claims that the Commission, on account of the unreasonable action of their inspectors at Miraflores in cutting out rivets to an extent never heard of before, should reimburse him for the average amount established in the table, which is \$46,850 plus \$58,350 divided by 2, or \$52,600.

(f) *Excess grinding*.—The total cost of machine work at Miraflores amounted to \$119,900. One-third of this was spent in grinding the end plates and the nickel-steel bearing plates. Three-fourths of this grinding was unnecessary, and either contrary to previous agreement or contrary to the contract requirements.

The Contractor, therefore, claims three-fourths of one-third of \$119,900, or \$29,966.

(g) *Excess cleaning*.—The Contractor spent at Miraflores \$14,856 for cleaning the interior of the leaves. One-half of this cleaning had to be done on account of the paint called for by the Commission deteriorating under the climatic conditions on the Isthmus.

The Contractor therefore claims one-half of \$14,856, or \$7,428.



(h) *Rush work.*—The table on the following page shows the total costs and the costs per ton for the erection of the various leaves at Miraflores.

From this table it will be seen that leaves 124 to 127—all of which had to be erected in the shortest possible time—cost \$59.28 per ton. Leaves 120 to 123—two of which had to be erected in a great rush (otherwise the conditions being identical)—cost \$51.24. Leaves 100 to 103—all of which had to be erected in a great rush, although not quite as much as 124 to 127—cost \$57.44. More or less rush work also had to be done on leaves 104 to 123 located on one side of the canal.

It will be seen from the above that rushing two leaves increases the cost for the total tonnage of four leaves by about \$8 per ton, or it is fair to state that if these Miraflores gates had not need to be rushed—either all the way across the two chambers or across one chamber only—the total cost of all these leaves would have been \$8 per ton below the average, or about \$43 per ton.

Erection costs at Miraflores.

Contract No.	Leaf Nos.	Location.	Leaves.		Total.	Erection cost at Isthmus.	
			Num-ber.	Height.		Total.	Per ton.
				<i>Ft. In.</i>	<i>Tons.</i>		
4857	100-103	Upper guard gates.....	4	47 4	1,567	\$90,020	\$57.44
4859	104-107	Upper gates.....	4	77 0	2,752	133,056	48.35
4861	108-111	Middle gates, upper lock.....	4	77 0	2,738	131,240	47.93
4863	112-119	Safety gates and lower gates, upper lock.	8	77 0	5,462	270,579	49.53
4865	120-123	Lower gates, lower lock.....	4	82 0	2,954	151,319	51.248
4867	124-127	Lower guard gates.....	4	66 0	2,279	135,045	59.28
					17,752	911,259	51.35

To verify this the Contractor has made an analysis of the money spent for the regular day's work and the overtime at Miraflores, and finds as follows:

Pay for regular hours worked.....	\$603,515
Pay for overtime, exclusive of excess rate, 27.9 per cent.....	168,560
	772,075
Excess paid white labor for overtime, 7.45 per cent.....	57,532
Total.....	829,607

From this it will be seen that a claim of \$8 per ton for the rush work is entirely fair for the reasons:

First. In order to get the work done the largest possible number of men was crowded on these leaves, which, of course, meant lack of efficiency and increased the cost.

Second. These men had to work on an average 28 per cent over-time over the regular hours they were supposed to work. That means that every man all the time averaged 13½ hours overtime per week. This naturally means lack of efficiency and increased cost.

Third. At Miraflores the Contractor actually had to spend in excess rates paid for overtime to the white labor \$57,532, which amounts

to \$3.25 per ton on the Miraflores tonnage, or to approximately 7½ per cent of the normal cost.

The Contractor therefore claims that on account of this rush work he had to incur an extra expense of \$8 per ton on approximately 17,750 tons, or \$142,000.

It has been shown that the normal costs of erection at Miraflores should have been \$33.49 per ton.

The Contractor concedes that to get the work started at Gatun and Pedro Miguel a certain amount of excess cost should be allowed on the first leaves erected at these sites, and he has estimated that a liberal allowance on account of this would be 50 per cent on 8 leaves at Gatun and 30 per cent on 8 leaves at Pedro Miguel. This would make the normal cost, both at Gatun and Pedro Miguel, 10 per cent higher than the cost at Miraflores, or \$36.84 per ton.

The Contractor therefore claims that there is due him from the Commission the following amounts:

Gatun, 25,498 tons at \$53.83 minus \$36.84 equals-----	\$433, 210
Pedro Miguel, 14,924 tons at \$59.37 minus \$36.84 equals-----	336, 238
Miraflores, 17,752 tons-----	314, 967
Total -----	1, 084, 415
To this should be added an amount covering transportation, liability, and general expense, which should be prorated in accordance with the actual total expense and the Contractor's claim, or	
391,891 × 1,084,415 ÷ 3,170,007 equals-----	134, 060
	1, 218, 475

This is the total amount claimed by the Contractor as to the extra expense he was put to at the Isthmus on account of actions of the Commission.

7. Extra cost of erection outfit, required to complete the work within time demanded, \$200,000.

The total cost of equipment and tools for this work, less the salvage, was about \$400,000. As closely as we can figure, nearly twice as much equipment and more than twice the number of small tools, bolts, and washers were used than would have been required had it been possible to carry on the erection without resorting to the rush work necessary to complete the work on time to suit the Commission's requirements. The cost chargeable to the Commission is one-half of \$400,000, or \$200,000.

N. B.—An additional claim covering interest charges on account of deferred payments will be presented in detail as soon as it can be compiled.

#### APPENDIX.

PITTSBURGH, PA., *September 5, 1914.*

MR. C. D. MARSHALL,

*President McClintic-Marshall Construction Co.,  
Pittsburgh, Pa.*

DEAR SIR: I beg to report on the changes made in the plans and specifications and on the delays we had in the preparation and approval of the shop drawings for the Panama lock gates, W. O. 23444, our contracts 4845 to 4867, inclusive, as follows:



## I. CHANGES IN PLANS AND SPECIFICATIONS AND DELAYS CAUSED BY THE SAME IN THE PREPARATION OF DRAWINGS.

A.—The work was held up for quite some time on account of a proposed change in the construction of the manhole covers. When we visited, with Mr. Goldmark, the various ship plants the latter part of July, 1910, the officials of the New York Shipbuilding Co. pointed out to us that a good deal of weight could be saved in these manholes if, instead of making them of cast steel, they would be built up of pressed structural steel, as is the regular practice in ship work. They further pointed out, showing samples, that in their construction the rubber rings that make these manholes water-tight were tightly held in place, while in the Commission's design the friction was entirely depended upon to hold these rubber rings. There was serious doubt in their minds whether this arrangement would meet the requirements. Mr. Goldmark took kindly to their suggestions, and it was therefore arranged that we would receive from them quotations and plans covering manholes of the type used by them in ship work. Under date of September 5 we received from the New York Shipbuilding Co. a quotation for this work.

The designs, however, were not forthcoming until September 27 and were then (Mr. Goldmark having departed for the Isthmus) turned over to Mr. Hammer. These designs were not satisfactory to Mr. Hammer. He then secured a man from us to assist him in working them up in accordance with his own ideas. We received from him, under date of October 17, sketches 201 and 202, and under date of October 29 sketches 203 and 207, covering these manhole covers, and on November 1 we received a letter from Mr. Hammer requesting us to submit prices based on these sketches. We then sent these drawings to the Wheeling Mold & Foundry Co. (our subcontractors on this class of work) and received their quotation November 5. This quotation was so high that we sent out inquiries to other parties and at the same time started to prepare prices ourselves. A list of these prices was finally submitted to Capt. Boggs on November 30. While we received word on December 5 that the original covers with some modifications would be used, as late as December 19 the matter was still in abeyance, as shown by our letter of that date to Mr. Hammer, which reads:

*I. C. C. 576, manhole covers.*—This confirms our conversation of this afternoon that it will not be safe for us to proceed with the steel frames for manholes on the water-tight frames until the modified plans have been received from the Isthmus.

On December 17 we received a letter from Mr. Hammer advising us that we could proceed with the fabrication of the water-tight frames except that the connections for the manhole covers should at the present time be omitted, as a revised drawing was on the way which would show slight changes. On December 24 we finally received the revised prints of sheet 5065, and on the same date prints of sketch 209, showing the manhole cover to take the place of the original air vent cover in the girder on top of the air chamber. This completed the necessary information.

We wish to emphasize that the water-tight frames were the most complicated parts of the whole construction, naturally requiring a long time for fabrication. From the above will be seen that we could not even order the web plates for these frames until we received word

from Mr. Hammer under date of December 17. This made a most serious delay, and even though we used every effort to hurry this work all we possibly could, as a matter of fact, the assembling of the first leaf at our Rankin shop was actually held up two to three weeks waiting for these frames, as after the bottom girder and the heel casting had been laid down, quite some time was spent waiting for the water-tight frames of the lower panel, without which the work could not proceed further.

For this delay we put in a claim for an extension of time of 114 days, based on my letter to you dated December 21, 1910, which reads as follows:

I. C. C. 576—Claims and allowances for extension of time.—Referring to the Isthmian Canal lock gates, as explained in detail to you in my report of October 31, we have been considerably delayed in the execution of this work.

With the exception of the manhole covers, we have now all the information before us. The information for the manhole covers we expect to get within the next week, but so far Mr. Hammer does not think it safe to place this order, as you will see from copy of my letter to him under date of December 19.

The last information received is that for the water-tight frames. Mr. Hammer's letter of December 17 released the material orders for these frames. These frames are about the most complicated work on the gates, and on the completion of the same will depend the time when we can start assembling the first leaf at our shops.

The first material orders for the leaves left our office August 25. It is the writer's opinion that we should at least be entitled to an extension of time from this date to December 17, which would make the allowance 114 days and would make the completion of the last gate September 22, 1913, against June 1, 1913. There is, however, a strong probability that we are legally entitled to an extension of time covering the period from the date of the contract, which is June 21, 1910, to December 17, 1910. This would make an allowance of 179 days and would make the date of completion of the last gate November 26, 1913.

B.—After the contract was awarded to us it developed that changes either would have to be made, or had better be made, both in the specifications and plans. The matter was thoroughly gone over between Mr. Goldmark and myself, and the modifications embodied in an agreement started during the week beginning July 11 and finished and finally adopted by Mr. Goldmark in his letter of August 8, 1910.

The changes were of a threefold nature:

(1) Changes that had to be made because the design or the specifications were deficient.

(2) Changes that were made to improve the design and get the best possible results.

(3) Changes that were made to save us some expense in order to offset additional expense we had to incur on account of the changes previously mentioned under 1 and 2.

The following is a résumé of these changes:

#### FIRST.—CHANGES CAUSED BY DEFICIENCY IN DESIGN AND SPECIFICATIONS.

1. Page 24, paragraph 121, I. C. C. 576, states:

In the field erection the separate parts shall be tightly bolted together, using bolts in practically all of the holes, and the rivet and bolt holes shall then be reamed out to their full size.

Meaning that all field holes at the shop had to be punched one-eighth inch small and reamed out in the field one-sixteenth inch larger than the nominal size of the rivet.



This requirement was impracticable as far as the interior holes in the frame were concerned, (a) as it would have made the proper assembling and bolting up in the field extremely difficult and tedious and (b) as it would have consumed an enormous amount of time in the field on account of the large amount of hand reaming with small corner reamers in the closed compartments.

This was modified at our request by paragraph 32 of agreement dated August 8, 1910, as follows:

It has been agreed upon to ream the connections between all diaphragms and girders full size in the shop to iron templets.

This all told necessitated the reaming to the iron templets at the shop of 57,304 connections at an expense to us of about \$50,000 to \$60,000, somewhat offset by saving in field labor. This, however, caused a great saving of time in the field and insured better work, as all the connections were positively known to be correct when they left the shop. One of our superintendents stated recently of this procedure that if it had not been followed we might be assembling yet.

If, in case of an accident, the Government ever makes use of the spare parts shipped under our contract it will derive a great deal of benefit from all these connections being reamed to templet, as this will mean a great saving of time in repairs, which, of course, is very essential. However, we wish to bring out that for these spare parts this reaming meant a great expense to us with no saving in field work to offset at least part of this expense.

May I be permitted to also mention here that, as an offset for establishing new contract dates in the supplemental agreement of May, 1913, we also agreed to ream all these connections on the Balboa gates to templets, and this without extra compensation. This work we furnished delivered only, and it will be erected by the Government.

The results obtained, both in the assembling at the shop and in the field, fully proved the correctness of our judgment when we requested this change to be made. Unfortunately, however, this procedure proposed and carried out for the best of the work caused, on account of overexacting and unreasonable limitations imposed upon us by the inspectors, lots of delay and a great deal of unnecessary expense in the shops.

2. I. C. C. 576, page 24, paragraph 121, states:

In attaching the castings the holes in the structural work must be drilled from the solid to fit finished holes in castings.

That this was really intended to be carried out, and carried out literally, although even on cursory examination this seemed hardly possible to us, is borne out by the notations on the Commission's drawings and also by Mr. Goldmark's attitude when this modification was first proposed and further by the wording of the modification.

It can be readily seen that it would have been absolutely impossible to assemble the end reaction castings to the structural steel frame without any holes to hold them in place and properly line them up and hold them in alignment.

This was modified in agreement of August 8, 1910, by paragraph 34, which reads:

With the adjustment provided, it will be permissible to provide holes in the shop to connect the end reaction castings to the structural work. These holes to be made three-eighths inch smaller than the size of the bolts that go through them.

While this was the only way out of it, it meant more expense to us in the shop than if the work had been carried out as originally outlined by the Commission.

3. As Mr. Goldmark entertained apprehension as to the sufficiency of the strength of the doubling plates, these were modified as per paragraph 17 of the agreement, which reads as follows:

In all gates make the big plates in the lower corner at the pintle 2 feet 2 inches wider, to catch the next intercostal. For the 66-foot, 77-foot, 77-foot 10-inch, 79-foot, and 82-foot gates increase the doubling plates at the anchorage by running them one panel farther down.

The plates thus getting more than 100 inches wide, had to be bought at a higher price than figured. This also added considerable to the cost in the field on account of the additional reaming and riveting.

4. After careful study it was decided that the adjustment provided for the end reaction castings and the nickel-steel bearing plates was not sufficient. This was taken care of by paragraph 23 and paragraph 35 of the agreement, reading as follows:

It seems desirable to increase the taper of the wedge to three-eighths or one-half inch, widening the end reaction castings accordingly and thickening the sides of the same so that the outside plates will be parallel with the inside of the sheathing of the air chamber. (Par. 23.)

It has been decided to increase the thickness of babbitt between the nickel-steel bearing plates and end reaction castings from one-half to five-eighths inch. (Par. 35.)

This change caused us great additional expense, but was simply necessary.

5. The design of the sheathing was in many ways impracticable, if water-tightness of the leaves was to be obtained. After a careful study, modifications were therefore decided upon and established in paragraph 21 of the agreement, as follows:

Two bent plates will be used at the end, forming a joint just outside the connecting angles of diaphragm "A" on the upstream side of the leaf. These bent plates will be made of the same thickness as the thinnest sheathing over the air chamber on the downstream side. On the upstream side a filler will be used on these bent plates to make up the thickness used for the thinnest sheathing on this side. This filler only to lay on the face of the leaf. The thicker sheathing plates will be chamfered for about 4 inches where they join these bent plates by one-sixteenth inch and one-eighth inch, respectively. It has been decided to make the following changes in the sheathing:

79-foot gate, sheathing 8-9, downstream, from five-eighths to eleven-sixteenths inch.

79-foot gate, sheathing 8-9, upstream, from thirteen-sixteenths to seven-eighths inch.

54-foot 8-inch gate, sheathing 6-7, upstream, from eleven-sixteenths to three-fourths inch.

47-foot 4-inch gate, sheathing 6-7, upstream, from eleven-sixteenths to three-fourths inch.

In connection with this the upstream cover of girder 7 on the 54-foot 8-inch gate will be changed from nine-sixteenths to one-half inch.

In order to facilitate the calking of the girder on the top of the air chamber, it has been decided to make the sheathing above and below the girder on the top of the air chamber on the downstream side of the same thickness. This



will necessitate changing the sheathing above the top of the air chamber in the 77, 79, and 82 foot gates from five-eighths to eleven-sixteenths inch.

Above the air chamber on the upstream side a suitable filler will be used between the cover plate of the girder on top of the air chamber and the sheathing above, and one filler of suitable thickness will be used between the doubling plate above and the sheathing of the air chamber, and the wedge sufficiently increased in thickness to make up the balance. On the downstream side the sheathing above the top of the air chamber will be lifted by means of filler plates between the sheathing and the girders to the plane of the sheathing below the top of the air chamber. These fillers will be from one-sixteenth to one-fourth inch in thickness. Wherever the sheathing below the top of the air chamber changes the thickness, the thinner sheathing will be lifted up by means of a one-sixteenth-inch filler to the plane of the heavier sheathing below.

This was quite a radical change from the original design, simply necessary to get the desired results.

6. The design was at fault at the four corners of the steel frame, as it would have been impossible to make the work water-tight the way it was designed. This was modified by paragraph 10 of the agreement, as follows:

At the quoin and miter end, arrange the end plates, doubling plates and fillers in such a way that they can be calked on the bent plate, leaving a small opening in the corner of the castings, which shall be babbitted.

Where the end plates join, break the splices with the splices of the bent plates and fillers.

The wedges shall be made in two lengths for the 5-foot panels, terminating in the quarter points of the panel, and in one length for the shorter panels, terminating in the middle of the panel; the lengths to be correspondingly adjusted where panels of different lengths adjoin.

7. I. C. C. 576, page 24, paragraph 121, states:

The vertical distances between adjacent horizontal girders must not vary more than one-sixteenth inch from the dimensions shown on the plans.

But no provision was made for the adjustment in the building up of the leaves on account of packing out, etc. This had to be modified, and was modified, by paragraphs 27 and 28 of the agreement dated August 8, 1910, reading as follows:

It has been decided to make all the end reaction castings one-eighth inch short, using a filler at the joints for calking, the filler to be varied in thickness if necessary to take care of any variation between the height of the gates and the castings. (Par. 27.)

To allow for any variation in packing, the nonwater-tight frames and end diaphragms "A" and "B" will be made one-fourth inch short in every fourth panel and fillers one-eighth, three-sixteenths, and one-fourth inch will be provided, thus allowing the water-tight frames to determine the heights of the different panels in the gates. (Par. 28.)

To provide for the fillers of the outline of the end reaction castings as called for in paragraph 27 was a very costly procedure, but we only received compensation for the same at the regular pound price, and besides only for the nominal size required, although considerable spare ones had to be provided to meet all conditions. On this same basis we were only paid for the other fillers for the nominal sizes required and had to furnish and ship a large number of additional fillers at our own expense.

8. The end reaction castings were fastened to the structural steel by means of bolts only. This would have made it impossible to keep the leaves tight. This accounts for paragraph 33 of the agreement, which reads as follows:

It will be necessary to change the  $1\frac{1}{2}$ -inch bolts in the wings of end reaction castings to  $1\frac{1}{8}$ -inch rivets along the edge of these wings and  $1\frac{1}{4}$ -inch bolts near the back.



These rivets caused a great deal of trouble and expense to us in the field, as shown in Mr. Jewel's letter of March 16, 1912, which reads as follows:

Or what would answer the purpose would be to make all of the  $1\frac{1}{8}$ -inch rivets for the reaction castings taper, as this is a point upon which we are having a great number of cut-outs. It is difficult to get these rivets to the inside and start driving promptly, and consequently we are losing a large number on account of the inside head not being properly upset.

On account of this we tried hard to get paid for these at the price of item 2 covering the bolts originally called for, which is 7.3 cents per pound, but were not allowed anything above the price for item No. 1, or 3.785 cents per pound. On account of this the Commission saved about \$5,000 at a large expense to us.

9. The original design called for seven-eighths-inch rivets throughout. For the heavy work on the upstream side of the air chamber these rivets were too small, and not up to the naval standard. This explains paragraph No. 18 of the agreement which reads:

Wherever the skin is more than eleven-sixteenths inch in thickness on the upstream side, use 1-inch rivets with 8 by 8 inch angles.

This increased 1,427,000 seven-eighths-inch field rivets to 1 inch diameter, causing considerable expense to us in the higher-priced material and the increased weight of the rivets and in the greater difficulty of driving the same.

#### SECOND—CHANGES THAT IMPROVED THE DESIGN.

10. It was considered very desirable to eliminate as many splices as possible, thus reducing the possible amount of leakage. To do this, the splices were omitted in all cover plates and the number of splices in each upstream sheathing plate was reduced from 2 to 1. This change not only secured better construction, but resulted in a saving of 835,600 pounds in weight, which at the contract price saved the Commission \$31,627. This change, however, caused a considerable extra expense, as it was necessary to provide, free of charge, a considerable amount of material to box the cover plates together into posts, and also caused considerable extra expense in handling in the shop and field, together with extra insurance due to the necessity of loading these posts on deck rather than in the hold of the vessel. The saving to us in the extra work in caulking, etc., at these splices, according to the original design, was more than compensated by the loss to us due to the fact that the weight omitted consisted entirely of plain punched plates. This change was authorized in paragraphs Nos. 1 to 3 of the agreement with Mr. Goldmark of August 8, 1910.

11. As it was considered of great importance to maintain the correct distance back to back of flange angles in girders, and as this was deemed impossible with the web stiffeners cut short as shown on design, it was agreed to increase the length of these stiffeners slightly, milling them to fit against the flange angles. This required the additional expense of milling 47,776 stiffeners. This change was authorized in paragraph No. 20 of agreement with Mr. Goldmark dated August 8, 1910.

12. It was decided impracticable to build diaphragm "B" so as to properly fit between girders on account of its position in the



gates, and it was therefore decided to split this diaphragm, resulting in the addition of 23,400 holes to be reamed in the field and rivets to be driven. This change was authorized in paragraph No. 9 of agreement with Mr. Goldmark dated August 8, 1910.

All these changes were made for the benefit of the work pure and simple, and involved a large expenditure to us, as far as we can figure, amounting to from \$150,000 to \$180,000. To offset this additional expense some concessions were made, as covered by the agreement of August 8, 1910.

These constitute class 3 of the modifications:

13. Omit the clipping of the corners of the covers and reinforce plates. (Par. 4 of agreement.)

14. Change the tapered fillers on the girders at the top of the air chamber. (Par. 11 of agreement.)

15. We were allowed to use fillers under the bent stiffeners of the girders. (Par. 12 of agreement.)

16. We were allowed the use of squarehead bolts in certain cases. (Par. 22 of agreement.)

17. The limit of subpunched and reamed work against subdrilled and drilled work was raised from under three-fourths-inch material to three-fourths-inch material inclusive. (Par. 25 of the agreement.)

18. A small amount of planing was omitted. (Par. 24 of the agreement.)

19. We were allowed pickling in certain cases against the sand-blasting called for throughout originally. (Par. 26 of the agreement.)

All these changes, although made with the idea of saving us some money to offset the large extra expense we had been put to, were in no way detrimental to the work and in accordance with the best practice. But they not anywhere near made up for our increased expense, as with the exceptions of the changes given in paragraphs 25 and 26 of the agreement, they did not amount to anything in dollars and cents. The main saving we expected from change.

20. Which is touched on in the agreement in paragraph 16 as follows:

Permission is granted of making the end reaction castings one story in height only; this is done for the reason that the McClintic-Marshall Construction Co. expects to demonstrate during the assembling of some of the gates in their yard that the work can be done so near correct, that any minor adjustment can be made by means of babbitting between the end reaction castings and the nickel steel bearing plates and the planing of the end plates done at the shop instead of in the field.

We did demonstrate to Mr. Goldmark and Mr. Hammer, after the first leaves were assembled at the shop, that the gates built up so straight that with the modification of making the end reaction castings of only one story height this planning was unnecessary. We further proved to Mr. Goldmark that with the sun moving around the leaves there was enough movement of the steel at the ends of the leaves to make this planing ineffective, which was actually proved later on at the Isthmus. Then the planing for which we had allowed a large sum of money in our estimate was waived, with the understanding that any high spots caused by riveting in the shop or in the field would be ground off. Later we proved to Mr. Hammer that the rolled steel plates as they came from the mills were every bit as

good, if not better, than the shop-planed plates. Then this planing was waived, as our mill orders and approved drawings and bills show.

The contract gives on page 4, under "Table of corrections made in specifications printed in circular 576," the following:

Page 24, section 121, line 7: "The end plate shall be planed to a smooth surface." This refers to the plate 24 inches wide, at the extreme end of structural work. The outer surface of this plate is to be finished so that it shall form an exact plane for the entire height of the leaf. The original thickness of the plate provided must be sufficient to allow this planing without reducing final thickness of the plate below three-fourths of an inch.

As a matter of fact the end plates were ordered:

For the 47-foot 4-inch and 54-foot 8-inch leaves, thirteen-sixteenths inch thick.  
For the 66-foot leaves, three-fourths inch thick.

For all the leaves from 77 to 82 feet, inclusive, eleven-sixteenths inch thick.

The idea being to comply with three-fourths inch as called for in the contract in the leaf of medium height, varying the other end plates to correspond with the change of thickness in the skin on the downstream side, in order to keep the back of the end plates in the same position for all leaves. Examination will show the same thickness of material is specified as part of the finished leaves.

This clearly shows that all the planing of these end plates had been waived.

This is further brought out by a report made by Mr. Frank Price, chief inspector, to Mr. Hammer, toward the end of February, 1912, which reads in the last paragraph as follows:

Paragraphs 20 and 21 of the original specifications call for the entire surface of the end plates to be planed to a true surface after erection. This was modified by Mr. Goldmark August 8, 1910, to plane in the shop instead of in the field, and modified later to allow the end plates to be fabricated and accepted without planing, provided the work proved to be satisfactory. Taking into consideration the modification of the original contract, the shop should make special efforts to get this member satisfactory.

As to the high spots caused by riveting, we did grind these off in the shop and expected to do the same in the field. But as a matter of fact under the extreme and unreasonable inspection at the Isthmus we were obliged to grind these plates so that when a straight edge was laid over these end plates within each story in any direction a feeler one sixty-fourth inch in thickness could not be inserted between the straightedge and the end plate.

We claim that at least 75 per cent of this grinding was absolutely waste, especially in view of the fact that a heavy canvas water stop soaked in red lead and linseed oil was put between these plates and the end reaction castings before assembling for the full heights of the gates.

We further claim that a condition was imposed upon us that not only wiped out the amount of saving that we had expected to make to offset the large additional expense, but made us spend tens of thousands of dollars in excess.

It must be understood that practically no work was done in the office until the important points covered by the agreement of August 8, 1910, were settled, and that at least that much time was consumed right in the beginning in the earnest and honest effort to make absolutely sure that we were undertaking this unprecedented work



by the best possible methods in order to get the best results, and the changes made in themselves proved that this time was well spent.

We are glad and proud to be able to state now, after the successful completion of the work, that every one of our suggestions has proved in the execution of the work to have been the correct conception of the work as it had to be done.

This covers all the main points of the agreement with the exception of a number of points covering minor details. All told, the agreement approved August 8, 1910, covered 36 items.

C.—During the execution of the contract the necessity of further changes developed. These changes are given in the following paragraphs:

1. It was necessary to change the horizontal hinge on the covers for the manhole frames to a vertical hinge, as it was found impracticable to properly open and close them with a horizontal hinge. This change was made on all leaves except on the eight 54-foot 8-inch leaves first gotten out; as for these, manhole rings and covers had been fabricated when this condition was discovered by Mr. Hammer. In fact, the covers gotten out for these first leaves drew Mr. Hammer's attention to this condition. On these first eight leaves the manhole covers were therefore used with the horizontal hinge, but they were moved from the far side of the frame to the side toward the center of the leaf.

We received the first intimation of this proposed change in Mr. Hammer's letter of January 31, 1911. The revised design was submitted to us by Mr. Hammer with his letter of February 11, 1911, inquiring whether the modification in this design would affect our original price as established by the contract. This being not the case, the design was adopted some short time thereafter for all the balance of the leaves. The drawings that enabled us to proceed with this work were finally approved March 21, 1911. This change caused a most serious and expensive holdup in the field, as we again had to stop all work on the water-tight frames until the same was settled, and it also stopped for quite some time all work on the manhole covers and rings fabricated at Wheeling.

Meanwhile the balance of the material for the 77-foot leaves was gotten out and shipped to the Isthmus, and erection was actually held up at the Isthmus on account of our field forces waiting for the modified water-tight frames. After these were gotten out at the shop it was found absolutely impossible to get from the foundry the rings that should have been shipped attached to the same, and it was then decided to let the frames go forward without the rings, the idea being to ship the rings separate and attach them later in the field. This, of course, meant taking down these rings through the interior of the leaves and attaching them to the frames in the closed compartments. These rings then had to be riveted in these closed compartments and caulked for water-tightness. All this work, of course, should and could have been done much cheaper and much more expeditiously at the shops, and would have been so done if Mr. Hammer had not found it necessary to make the change. Our records show that all rings for the first sixteen 77-foot leaves, our contracts Nos. 4847 and 4851, and 90 more for leaves of the same size on our contract No. 4853, were shipped loose, making a total of



570 manhole frames shipped loose, which meant the driving of more than 11,000 rivets in the field in the closed compartments, and caulking for water-tightness of 570 rings in these compartments. This amply illustrates the seriousness of this holdup. However, it should not be forgotten that a large expense was also incurred by the field operations being suspended, our field forces waiting for quite some time.

We put in a claim of 28 days for this delay, although we are now satisfied in our own mind that this claim was entirely inadequate.

This delay coming at a time when we were pushing the work with all our might as our field forces were already waiting was very serious and expensive indeed.

2. A long time was consumed in finding the right kind of rubber gasket to use on the manholes of the water-tight frames. In the early stages of the tests the rubber ring of rectangular section was abandoned, as it soon developed that the covers could not be made water-tight with the same. For quite some time experiments were made with rings reinforced with metal spirals; for these, however, the elaborate specifications for rubber, established in I. C. C. 576, had to be abandoned, as nobody could be found who would be willing to undertake fabrication of these kind of rings under these specifications. Finally a ring or triangular cross section was decided upon.

As it was very desirable to ship the covers loose, a special apparatus was devised at Wheeling to test all rings with a standard cover and all covers with a standard ring in order to make this material interchangeable and at the same time to assure water-tightness. During these tests it developed that there was a good deal of difficulty about holding even the triangular rubber gaskets in place, as they blew out under pressure, exactly as had been pointed out to us and Mr. Goldmark while the modifications given on page 1 were discussed with us by the officials of the New York Shipbuilding Co.

These tests were started at Wheeling toward the end of May, 1911, as shown from Wheeling Mold & Foundry Co.'s letter of May 20, 1911. Numerous tests were then made with different kinds and different thicknesses of gaskets, until we wrote to Mr. Hammer, under date of August 12, 1911, as follows:

*I. C. C. 576—Manhole covers.*—Referring to our visit to Wheeling yesterday and the investigation and tests we made there on the manhole covers for the water-tight frames for the Isthmian Canal lock gates, Washington order 23444, it is apparent that it will be impossible to have the rubber gaskets stay in these covers for any length of time under a 40-pound pressure, unless they be held in place by a groove cut in the cover.

Please have this matter taken up at once, as we can not stand for any further delays in settling the construction of these covers, as it is self-apparent now that our work will be held up in the field on account of not having these covers available.

This matter was finally disposed of under date of August 21, 1911, when Mr. Hammer wrote as follows:

Confirming conversation over the phone in regard to providing grooves for rubber gaskets in the manhole covers for the water-tight vertical frames; also referring to your letter of the 12th instant regarding the same matter: Replying to my cable of the 15th instant, I received cablegram of the 18th from the Isthmus approving extra grooves in the manhole covers. You are, therefore, authorized to proceed with the manufacture of these manhole covers with grooves.



This delay got so aggravating that, with Mr. Hammer's approval, we made with Wheeling Mold & Foundry Co. a tentative agreement, as per our letter of August 18, 1911.

It should be noted that this change occurred 14 months after the award of the contract, and was really in line with the facts presented to us and Mr. Goldmark at the very beginning of the work by the shipyards.

3. Under date of September 7, 1910, I wrote to Mr. Hammer as follows:

In this connection I also wish to go on record that I think it is a mistake to attempt to build an air-tight chamber in the lower story of the gates. I have serious doubt whether it will be feasible to build such a chamber, but even if this can be done, it is a great question in my mind how long the same would stay air-tight, as, during the operation of the gates and when the gates lean against the sills, elastic deformations will take place, which in my opinion, in the course of time, will cause leakage in these chambers, in which case the whole pumping system would be put out of commission. If the present style of the pumping system is adhered to the built-in air chamber in my opinion should be done away with and replaced by suitable independent air receivers that could be fastened in the lower story of the gates, if necessary, in several of the compartments, making suitable connections between these air receivers.

We were fully convinced that a serious mistake had been made in the construction. Not hearing from Mr. Hammer, we wrote him again about this matter on September 24, 1910. Under date of October 1, 1910, Mr. Hammer wrote us that it had been decided to adhere to the original construction, as follows:

To-day I received letter of September 22 from Mr. Henry Goldmark, designing engineer, Isthmian Canal Commission, transmitting the inclosed blue print dated September 21, 1910, for drawing No. 5032-A.

You will kindly note from this drawing that it has been decided to use the pumping chamber as shown on our original drawing. The matter of calking for making this chamber air and water tight is also indicated on the drawing. There may be some slight modification in the valves and piping, none of which, however, will affect the structural work, which should proceed without any delay.

Waiting for this decision, we held up all work on the parts affected by the same, which are the bottom girder, the girder next to the bottom, and the lowest sheathing panel—all of which was the very first part of the work wanted. We then proceeded without delay on these drawings and pushed them all we could. After we got them all finished and checked, we received Mr. Hammond's letter of October 24, 1910, in which he states:

I am in receipt of a letter dated October 13 from Mr. Henry Goldmark, designing engineer, Isthmian Canal Commission, transmitting blue print of drawing No. 5063. It has been decided to omit the pumping chamber as originally shown in the bottom panel of leaf, and instead it is proposed to use a centrifugal pump for pumping purposes.

According to Mr. Goldmark, the piping, etc., keeps to the holes and lines established in our original plans with a very few exceptions, and he is not quite certain that the float control, as indicated in the drawing, will be used, but the 1½-inch pipe should be put in just the same.

This pumping chamber having been omitted, it will be necessary to replace the heavy I beams over the pump chamber in the girder with stiffener angles, and one of the water-tight frames at the end of the pumping chamber will be replaced with a nonwater-tight frame. It will be necessary to have holes in the horizontal girders for the shaft between the motor and the pump and also holes above the motor in the girders of the water chamber, allowing the shaft to be inserted from above.

Please note that in addition to the gate valves in the inlets a check valve is to be placed between the strainers and the other valve in order to enable the



system to be made automatic with valves remaining open. We may, however, replace the gate valves as indicated with a cock if a suitable cock can be obtained.

Details showing the proposed arrangement may be forwarded you shortly, although I believe the drawing No. 5063 will be sufficient for your guidance in working out drawings for the structural work.

As the omission of the pump chamber will relieve your firm from a considerable quantity of caulking, it is expected that you will put in additional holes required without any extra charge, and I am going to write an agreement to this effect. It is understood, of course, that the pump, motor, shaftings, floats, etc., will be installed by the Commission and are not to be included in your contract. You are, however, to furnish the piping as indicated, the valves, and check valves at the pound price stipulated in your bid. As only one print has been received of drawing No. 5063, I will propose that you have tracing made of it.

We then had to redraw the drawings affected. This was, to say the least, provoking. We answered Mr. Hammer under date of October 26, 1910. We call special attention to the lines: "It is expected that you will put in the additional holes required without any extra charge," etc. This is in line with the spirit in which every transaction of this contract was carried through. All other troubles this change caused us were promptly passed over, and, as a matter of fact, we did not even receive any compensation for the extra drawing work we were put to on account of this change. For this, however, we later on put in a claim for delay of 23 days.

We feel that we have saved the Commission considerable trouble and expense by raising this point in the first place, as we are as much convinced as ever that if the work had been built as originally designed it would have been only a question of time when changes would have had to be made in the finished structure.

4. The chambers at the quoin and miter ends of the leaves were originally, vertically, only connected by means of 10-inch vent holes and a corresponding vent cover was used on the girder at the top of the air chamber. The only way of access to and egress from these chambers was through the manholes in the water-tight frame toward the center of the leaves. It was then pointed out to Mr. Hammer that with this arrangement during the interior water test at least one inspector and two workmen would have to be confined in each of these compartments, and that in case of a bad leak or some unforeseen occurrence these men had no possible way of saving themselves, the adjoining compartments being filled with water. It was then decided to change the 10-inch diameter hole to 11 by 15-inch opening and use a manhole cover of corresponding size in the girder at the top of the air chamber. This matter was first touched on in Mr. Hammer's letter of November 22, and finally disposed of under date of December 24, 1910, when Mr. Hammer approved the drawing covering the manhole at the top of the air chamber.

These large holes, of course, caused considerable extra scrap, which was given by us in Article IV of the supplemental agreement dated June 15, 1911, for the Government waiving certain requirements in the original contract as to fire insurance in Article V.

Here again it should be noted that we had to give the Commission something that actually cost us a good amount of money, for something that in reality had no bearing whatever on the final result to be accomplished; in fact, for something—considering all circumstances of the case—that was, to say the least, uncalled for to be specified in the first place.



After this change was made we explained to Mr. Goldmark, and also wrote to Mr. Hammer, about it, that as all these chambers were now intercommunicating the necessity of having an opening covered with a manhole in each water-tight frame had been done away with, and that one, or at the utmost two, of such openings—one near the bottom and one near the top of the air chamber—would be sufficient. We strongly urged upon them a reduction in the number of these covers, as we knew they would be troublesome (as later on was actually the case). Such reductions would have been the more reasonable as it had been found quite a difficult matter to open and close these manhole covers, which made it quite self-evident that the men would always come out of the same hole by which they had entered. As Mr. Goldmark always seemed anxious to keep the weight down, we pointed out to him that by reducing the number of manholes considerable weight and expense could be saved (on the basis of two remaining manholes the number could have been cut down from 2,544 to 552, or a saving of 1,992 manholes, estimated at 422,000 pounds in weight and at \$92,000 in cost), but unfortunately no action was ever taken in this matter.

5. No provision had been made in the design for the use of water stops. In fact, Mr. Goldmark vigorously opposed their use in the beginning.

I. C. C. 576, page 11, paragraph 23, states in connection with the crimping of the water-tight frames:

This crimping must be smithed in such a manner as to obtain a close fit of both sides of the bounding angle to the adjoining structural parts and insure good contact for calking. In no case will the use of steel shavings be permitted for filling openings where the crimping is poorly done.

After careful investigation of the shipyard practice, and on strong representation of Mr. Guynn, water stops have been extensively used, and also steel shavings, or we should rather say wedges ("Dutchmen," in the shipbuilder's language), to make the work water-tight. The water stops cost us for the plain material alone \$7,560, and we estimate that after being properly soaked in linseed oil and red lead they have cost us in place in the neighborhood of \$22,000. We have tried to collect for this, but were only allowed payment in accordance with I. C. C. 576, paragraph 5, page 7, reading as follows:

Rubber gaskets and all packings in items 4 and 10 will be paid for at the same rate per pound as the metallic parts in the items in question.

It should be noted that this paragraph only refers to item 4, manholes and manshaft covers, and item 10, the pumping system, so that its application to item 1 seems hardly consistent. However, at this rate we collected for the water stops 5,872 pounds, at the rate of 3.785 cents per pound, or about \$232.25. The weight of the water stops on which we were allowed payment covers the water stops as shown on the drawings. As a matter of fact, a great deal of additional material had to be shipped to the Isthmus, the plain material for the water stops used amounting altogether to 22,940 pounds, but we have not been able to collect for this additional weight, even at the low pound price.

This always seemed a plain injustice to us. Items 4 and 10 were fully detailed showing all the packing required, which gave the Contractor ample chance to take care of this packing at the proper cost



in his pound price of the whole item. In item No. 1 water stops were not only not called for, but their use was strongly opposed in the beginning by Mr. Goldmark; yet at the same time when it comes to paying for these necessary adjuncts to the work the pound price for item No. 1 had to be applied the same as the pound price for items 4 and 10 were applied for the packing required for these items, with the difference, however, that in the latter case such was distinctly specified and the material required shown on the drawings.

6. In the corners, at the miter and quoin end of the leaves, very inadequate provision had been made on the Commission's drawings on the girder on top of the air chamber to make this joint water-tight. This matter was pointed out first by Mr. Guynn, and we all saw, after his representation, that it would be practically impossible to make this point water-tight the way it had been designed. As this was very important (as leakage from the water chamber above into the air chamber below at this point would have been a very serious matter) thorough study was given this detail, and as it was rather troublesome to find a good solution various schemes were under consideration, like the use of steel castings, etc. Mr. Guynn finally suggested to use a forged angle with planed ends at this point, butting against planed ends of the chord angle of the girder. This was finally adopted, and apparently has given excellent results. However, it was a very troublesome and expensive detail to make and put us to a large expense.

7. After consultation with the various water-tight experts, in a visit made by Mr. Hammer and ourselves to the shipyards in the East, it was decided to countersink all rivets in water-tight work. (See agreement with Mr. Hammer, Oct. 6, 1910.) This matter was referred by Mr. Hammer to Mr. Goldmark, who took issue with Mr. Hammer in regard to this change. This agreement was therefore modified so that only rivets inaccessible for calking, such as in water-tight frames, flange angles of girders, etc., should be countersunk. This change in the plans and specifications required the countersinking in the shop of 440,000 holes and in the field of 308,000 holes, involving considerable extra expense to us. This change, however, saved the Commission \$6,375, as, according to the original designs, they would have been required to pay for 748,000 rivet heads which were omitted by this change. The engineer in charge of erection objected to the extra expense of countersinking these holes in the field, so ordered full head rivets for the first gate. The result of this change was brought out very clearly in letter of Mr. L. L. Jewel, of July 11, 1912. On account of the attitude of the field inspectors it was, therefore, decided to use countersunk rivets at all of these points, as had already been agreed upon with Mr. Goldmark and Mr. Hammer.

8. The designs for the water-tight frames showed the bounding angles made in four pieces with plain butt joints. After consulting with water-tight experts and considerable experimenting, it was decided to weld these joints, making these angles in one continuous piece. (See Mr. Hammer's letter of Jan. 6, 1911, in regard to this.) This change resulted in a large extra expense to us because of welding four joints in each of these 2,544 staple angles, and also on account of the great care necessary in making these continuous angles to the exact dimensions desired.



D.—The progress of the work was further interfered with as follows:

1. Long delays occurred in connection with the pumping chamber and pumping system. The occurrences in connection with the pumping chamber are given in detail under "C," paragraph 3. The rest of the information of the pumping system was settled in Mr. Hammer's letter of October 31, 1910.

This letter made some quite important changes. Later on some more difficulties arose, which, however, did not affect the structural steel. (See letter of Mr. Hammer to us of Sept. 11, 1911, and Crane Co.'s letter to us of Sept. 15, 1911.)

2. For a long time the necessary information as to the mitering mechanism was not obtainable. We draw attention to Mr. Hammer's letter of September 29, 1910, and our answer of September 30, 1910. Our records show that this information was forthcoming in the next three or four weeks. March 29, 1911, Mr. Hammer instructed us as to further changes in connection with the mitering mechanism. It will be noted that this was nine months after the award of the contract.

3. Quite a serious change was made by Mr. Hammer in the skin of the 77-foot leaves after the shop drawings had been practically finished and checked. As Mr. Hammer did not heed our request to put the instructions for this change in writing, I went on record about it under date of January 10, 1911, as follows:

*I. C. C. 576—Engineering and drafting.*—You informed the writer verbally yesterday that the skin on the 77-foot gates was not gotten out in accordance with your wishes, but contrary to verbal instructions issued by you to our Mr. Frosell in charge of this work about three months ago and would have to be rearranged. The writer asked you then yesterday to kindly confirm in writing that you wished this sheathing changed, and was informed by you that you were not ready to do this at this time but would do so when in the regular course of business you could take up this work for checking. As we have not time to wait for this, we write this letter confirming your instructions to make the change and at the same time advise you that we will do so, as we must get this work in the shop and can not wait to have this matter referred to the Isthmus.

It is very unfortunate that the verbal instructions given to the squad master in charge of this work were at the time being not confirmed in writing, as in this case both our chief draftsman and the writer would have been cognizant of the instructions issued and would have certainly seen that they were carried out to the letter. This is particularly unfortunate, as these instructions were of such far-reaching nature. Now, the squad master claims that he did not understand what you wished him to do, which is quite apparent, as there could have been no earthly reason why he should not have lived up to your instructions if he had properly understood.

The schedule showing the arrangement of the splices in these gates was submitted to you under the date of October 1, and the original detail drawings were submitted to you between the dates of October 8 and November 17. While it was true that new drawings for these details have been submitted to you off and on, incorporating changes that had been made by you on the other gates, it nevertheless remains a fact that even a cursory examination of the original details would have shown at once that they were not gotten out in accordance with the instructions which you meant to issue. We will now have to re-mark all the skin work and redetail quite a number of the sheets. We will also have to put some of the material in stock and some of the sheathing received for these particular gates will have to be applied to other gates and new material ordered from the mills.

This is rather a serious condition to get in, when the shop is ready to take up the work. While as you say, it will not delay getting these particular drawings to the shop, as you would not be able to take up approval of same



before the time that they can be redrawn, at the time it will delay all the other drawings for just the amount of time it will take to make this change.

The writer is extremely sorry that this matter has occurred, particularly so as, as far as he can see, the changes are only necessary to avoid the ordering of a few spare parts at the top of the gates, the tonnage of which will probably be fully offset by other spare parts that will have to be ordered after the changes are made for the lower parts of the gate.

This letter is self-explanatory, but it should be noted that this occurred just at the time when the shop was fairly begging for the drawings of those 77-foot leaves and at a time when everybody from Mr. McClintic down was after Mr. Hammer to get these drawings approved.

4. The rivet gauges in flange angles was agreed upon with Mr. Goldmark and the drawings started on the basis of this agreement. Later on, after a great number of drawings had been made, it was decided by Mr. Hammer that it was necessary to change these gauges. This change required revision on some 50 to 75 drawings, as it changed girders, sheathing plates, cover plates, water-tight frames, nonwater-tight frames, bent plates, end plates, etc., causing serious delay and considerable expense in our drawing-room.

## II. DELAY IN THE APPROVAL OF DRAWINGS.

The shop drawings, being the foundation for all further operations, were given a great deal of thought and study. Before the drafting work was started, as basis of the requirements of the shop and field to meet the contract dates, a careful schedule was prepared showing when the drawings should be submitted for approval, and when they should be actually approved, making the customary allowance for time required for approval of drawings.

It took 266 bills, 300 shop drawings, and 1,141 tables of quantities and weights to cover this work. In all our experience we have never seen a contract where the drawings have been taken up in a more systematic way. Elaborate data sheets—52 in number—were prepared to cover all points before the drawings were actually started, and a large force of especially picked engineers and draftsmen were employed to handle this work as best we knew how.

Table 1, attached, shows that while for the early leaves the schedule (as far as submitting drawings for approval is concerned) was not adhered to, for the later leaves (on account of the increased force we put on this work) the drawings were very nearly gotten out on time. The delay for the early leaves can easily be explained by all the difficulties we had to contend with that I have gone into detail in the forepart of this report.

When it came to the approval of the drawings, however, the matter is just reversed. While the early leaves are not much farther behind than we were behind in submitting the drawings for approval, for the later leaves the delay is enormous.

Examination of table 2, attached, shows a very prompt approval for the drawings for the 54-foot 8-inch leaves. A little more delay occurred for the first sixteen 77-foot leaves covered by our contracts 4847 and 4851, while the remaining twenty-four 77-foot leaves covered by our contracts 4859 and 4861 and 4863 submitted between October 1, 1910, and January 31, 1911, were not approved until January 18, 1912.

The 79-foot leaves, our contract 4859, were approved fairly promptly, except a few sheets that hung back.



On the 77-foot 10-inch leaves, however, our contract 4855, the drawings which we submitted between October 1, 1910, and March 6, 1911, were not finally approved until June 9 to September 16, 1911.

On the 47-foot 4-inch leaves, final drawings for which we submitted April 26, 1911, they were not approved until September 18 to November 13, 1911.

While we realize that some of this delay was caused by Mr. Hammer having to go over all these drawings and tables personally, both in checking and approving, and can find this as a valid excuse as far as Mr. Hammer is concerned, we certainly blame the Commission for this delay, as the organization should have been such that the work could have been handled more promptly.

Mr. Hammer has given us two reasons for holding off on the approval of certain leaves, one being that he wished to hear from the Isthmus how early leaves came out before he approved any more drawings, and the second one that he did not care to approve any more drawings, as the shop did not have any use for them.

These were the reasons why the approval of the last twenty-four 77-foot leaves were delayed for over seven months after the first 16 leaves had been approved, and for the second reason alone the 82-foot leaves, contract 4865, which were submitted between October 1, 1910, and April 28, 1911, were only approved between March 6 and 18, 1912; and the 66-foot leaves, contract 4867, submitted the same time, approved between April 2 and May 10, 1912, and this only after Mr. McClintic had written to Mr. Goldmark, under date of January 25, 1912, as follows:

We intend to exert every effort to finish up the lock gates on time, and to this end we are anxious to complete the shopwork for the gates at the earliest possible moment. In order to do this we would like to have the detail drawings for the 82-foot leaves, our contract 4865, and for the spare parts, our contract 4873, checked and turned over to us not later than March 1, 1912, and the details for the 66-foot leaves, our contract 4867, checked up and turned over to us not later than April 1.

We trust that you will see your way clear to do this without serious inconvenience to yourself.

When Mr. Goldmark received this letter he cabled instructions to Mr. Hammer to get this matter going.

Mr. Goldmark stated to me on the Isthmus the beginning of 1913, when this matter was discussed, that he had never been aware of Mr. Hammer holding off on approval of this work as he had done.

In our claim for extension of time we put in 40 days' delay for the 82 and 66-foot leaves. This figure is entirely too conservative, however; in fact, we see no reason why, in accordance with established custom and practice, we could not claim a delay of pretty nearly one year on the 82 and 66-foot leaves.

Numerous letters are on file to show our earnest efforts to get the drawings approved and in the shop. But these only tell half the story, as both Mr. Pendergrass and myself kept after Mr. Hammer in this matter all the time, as we naturally were anxious to have this work cleaned up in the drawing room and get the men working on the lock gates available for other work, also to get all these matters finally disposed of while they were fresh and clear in everybody's mind.

Sometimes we felt that Mr. Hammer very much resented our pushing him so hard about the approval of these drawings; in fact, we feel that the occurrence described under "D," paragraph 3, was

purely a matter of Mr. Hammer penalizing us for pushing him too hard to get the drawings of the 77-foot leaves approved. This is the reason we asked him to put this matter in writing, and why, when he refused to do this, I wrote him under date of January 10, 1911, this rather unusual letter.

The hanging on of this work naturally increased our office expense a great deal, and, more serious than that, delayed shipments resulted.

Respectfully submitted.

PAUL L. WOLFEL,  
Chief Engineer.

TABLE No. 1.—Comparison of approval of drawings as scheduled and as it actually occurred.

Con- tract.	Height.	Drawings for approval.		Drawings approved.		Days behind schedule for approved drawings.
		Scheduled.	Actual.	Scheduled.	Actual.	
4845	<i>Ft. in.</i> 54 8	Sept. 3, 1910	Oct. 1, 1910, to Jan. 11, 1911.	Sept. 17, 1910	Oct. 29, 1910, to Jan. 21, 1911.	42-126
4847	77 0	Oct. 13, 1910	Oct. 1, 1910, to Jan. 31, 1911.	Oct. 27, 1910	Oct. 29, 1910, to June 9, 1911.	2-255
4849	79 0	Dec. 4, 1910	Oct. 1, 1910, to Feb. 25, 1911.	Dec. 18, 1910	Oct. 29, 1910, to June 10, 1911.	235
4851	77 0	Oct. 13, 1910	Oct. 1, 1910, to Jan. 31, 1911.	Oct. 27, 1910	Oct. 29, 1910, to June 10, 1911.	256
4853	79 0	Dec. 4, 1910	Oct. 1, 1910, to Feb. 25, 1911.	Dec. 18, 1910	.....do.....	235
4855	77 10	Mar. 15, 1911	Oct. 1, 1910, to Mar. 6, 1911.	Apr. 1, 1911	June 9, 1911, to Sept. 16, 1911.	163
4857	47 4	Apr. 1, 1911	Oct. 1, 1910, to Apr. 28, 1911.	Apr. 15, 1911	Sept. 18, 1911, to Nov. 13, 1911.	156-212
4857½	47 4	Apr. 8, 1911	.....do.....	Apr. 22, 1911	.....do.....	149-205
4859	77 0	Oct. 13, 1910 to Jan. 31, 1911	Oct. 1, 1910, to Jan. 31, 1911.	Oct. 27, 1910	Jan. 18, 1912.....	459
4861	77 0	Oct. 13, 1910	.....do.....	.....do.....	.....do.....	459
4863	77 0	.....do.....	.....do.....	.....do.....	.....do.....	459
4865	82 0	Apr. 15, 1911	Oct. 1, 1910, to Apr. 28, 1911.	May 1, 1911	Mar. 6, 1912, to Mar. 18, 1912.	310-322
4867	66 0	Apr. 22, 1911	.....do.....	May 7, 1911	.....do.....	304-316

TABLE No. 2.—Record of approval of drawings

Con- tract.	Height.	Prints for approval.	Returned for cor- rection.	Tracing for approval.	Tracings approved.
	<i>Ft. in.</i>				
4845	54 8	Oct. 1, 1910, to Jan. 11, 1911.	Oct. 27, 1910, to Jan. 21, 1911.	Oct. 28, 1910, to Jan. 21, 1911.	Oct. 29, 1910, to Jan. 21, 1911.
4847	77 0	Oct. 1, 1910, to Jan. 31, 1911.	Oct. 27, 1910, to Feb. 27, 1911.	Oct. 28, 1910, to Apr. 8, 1911.	Oct. 29, 1910, to June 9, 1911.
4849	79 0	Oct. 1, 1910, to Feb. 25, 1911.	None returned.....	Oct. 28, 1910, to June 10, 1911.	Oct. 29, 1910, to June 10, 1911.
4851	77 0	Oct. 1, 1910, to Jan. 31, 1911.	Oct. 27, 1910, to Feb. 27, 1911.	Oct. 28, 1910, to Apr. 8, 1911.	Oct. 29, 1910, to June 9, 1911.
4853	79 0	Oct. 1, 1910, to Feb. 25, 1911.	None returned.....	Oct. 28, 1910, to June 10, 1911.	Oct. 29, 1910, to June 10, 1911.
4855	77 10	Oct. 1, 1910, to Mar. 6, 1911.	.....do.....	June 9, 1911, to Sept. 11, 1911.	June 9, 1911, to Sept. 16, 1911.
4857	47 4	Oct. 1, 1910, to Apr. 28, 1911.	.....do.....	Sept. 18, 1911, to Oct. 21, 1911.	Sept. 18, 1911, to Nov. 13, 1911.
4857½	47 4	.....do.....	.....do.....	.....do.....	Do.
1 4859	77 0	Oct. 1, 1910, to Jan. 31, 1911.	.....do.....	.....do.....	Jan. 18, 1912.
1 4861	77 0	.....do.....	.....do.....	.....do.....	Do.
1 4863	77 0	.....do.....	.....do.....	.....do.....	Do.
4865	82 0	Oct. 1, 1910, to Apr. 28, 1911.	.....do.....	Mar. 6, 1912, to Mar. 13, 1912.	Mar. 6, 1912, to Mar. 18, 1912.
4867	66 0	.....do.....	.....do.....	Apr. 2, 1912, to May 10, 1912.	Apr. 2, 1912, to May 10, 1912.

1 Entire contract approved by letter.



MODIFICATIONS DECIDED ON BY MR. HENRY GOLDMARK ON THE DESIGN FOR LOCK GATES FOR ISTHMIAN CANAL COMMISSION CONTRACTS Nos. 4849 TO 4865, INCLUSIVE, W. O. 23444, AUGUST 8, 1910.

First. The 13 $\frac{1}{4}$ -inch cover plates on the downstream side of leaves will be made in one length and shipped bolted on to the girders. In order to protect the planed edge of these cover plates during shipment, they will be reduced in width to 12 $\frac{3}{8}$  inches, so that the edge is inside the flange angles.

Second. The sheathing plates on the downstream side will be made in two lengths instead of three, as shown, the splices to be in the panel next to the center, alternating from one side of the center to the other in successive panels.

Third. On the upstream side the cover plates will be shipped in one length. The 13-inch covers above the air chamber to be bolted to the girders. The covers on the wide doubling plates at the bottom of the leaves for shipment will be bolted to the web of the girders at the top of the air chamber on the side where no stiffeners occur, and the long wide covers on the air chamber will for shipment be bolted together by means of timbers, and some of the 13-inch covers in shape of posts, carefully protecting the planed edges by means of timber packing pieces.

The omission of splices in the cover plates will make it possible to omit the short cover splices used in the upper part of the upstream side and will reduce the length of the short cover plates on the lower side of this face, so that they will project one line of rivets beyond the splice plate nearest to the miter and quoin end.

Fourth. It will be permissible to omit the clipping of the corners of the cover plates and of the reinforcing plates on webs around man-holes, etc.

Fifth. The rivet spacing in splice plates and intercostals on the downstream side in panels 8 to 9 should be made the same as in downstream side panels 2 to 3, with a pitch of about 4 $\frac{1}{4}$  inches.

Sixth. The rivet spacing in web splices and intercostals above the air chamber on the upstream side can be modified as per sketch No. 25 attached.

Seventh. The connection for the end diaphragm "A" is to be proportioned in accordance with strains given in Mr. Goldmark's memorandum book No. 22, pages 3 to 12, inclusive, using 9,000 pounds per square inch as permissible shear, which shear can be increased to 10,000 pounds per square inch in the lower panels, if necessary. Also check webs in these diaphragms for 10,000 pounds shear per square inch gross.

Eighth. In the girders, run the chord angles through, so that they can be faced with end of girder, and make the doubling plate of the same thickness as the angles on the downstream side.

In the girder at the top of the air chamber, keep the doubling plate far enough away from the chord angles to allow for calking.

Ninth. The end diaphragm "B" shall be split in the center line of diaphragm "A," using a proper splice and field riveting the chord angles to one-half of the diaphragm.

Tenth. At the quoin and miter end, arrange the end plates, doubling plates, and fillers in such a way that they can be calked on the bent plate, leaving a small opening in the corner of the castings, which shall be babbitted.

Where the end plates join, break the splices with the splices of the bent plates and fillers.

The wedges shall be made in two lengths for the 5 foot panels, terminating in the quarter points of the panel, and in one length for the shorter panels, terminating in the middle of the panel; the lengths to be correspondingly adjusted where panels of different lengths adjoin.

Eleventh. On the girder at the top of the air chamber, omit the tapered fillers and use one filler of seven-sixteenths inch between the chord angles and one filler of five-sixteenths inch running over the 6-inch chord angles.

Twelfth. It will be permissible to use fillers under the bent stiffeners in the girders of the thickness of the angles on the upstream side.

Thirteenth. Referring to the intercostals on the downstream side, extend the 8-inch channels one panel higher and in the three panels above change the 5-inch Z bar to 6 by  $3\frac{1}{2}$  by  $\frac{5}{8}$  inch, nine-sixteenths inch, and seven-sixteenths inch angles, respectively. On the upstream side, change the 5-inch Z bars to 6 by  $3\frac{1}{2}$  by seven-sixteenths inch angles throughout.

Cut all the channels and angles short at 6-inch flange angles of girders, but cope them 2 inches over the 8-inch-flange angles, using one-half-inch connection plates and four seven-eighths-inch rivets for the channels, and seven-sixteenths-inch plates and three seven-eighths-inch rivets for the angles.

Fourteenth. Where the I-beam stiffeners on the bottom girders and on the girders on top of the air chamber have to be bent to connect them to the stiffeners, a built-up member of I or channel section can be substituted.

Fifteenth. It is feared that the painting of surfaces in contact where water-tight work is required may cause leakage on account of the paint being burned off by the rivets. This matter will be further investigated with the view of either omitting the painting altogether or substituting a coat of oil or oil with a light pigment in its place.

Sixteenth. Permission is granted of making the end reaction castings one story in height only. This is done for the reason that the McClintic-Marshall Construction Co. expects to demonstrate during the assembling of some of the gates in their yard that the work can be done so near correct that any minor adjustment can be made by means of babbitting between the end reaction castings and the nickel steel bearing plates and the planing of the end plates done at the shop instead of in the field.

Seventeenth. In all gates make the big plates in the lower corner at the pintle 2 feet 2 inches wider to catch the next intercostal.

For the 66-foot, 77-foot, 77-foot 10-inch, 79-foot, and 82-foot gates increase the doubling plates at the anchorage by running them one panel farther down.

Eighteenth. Wherever the skin is more than eleven-sixteenth inch in thickness on the upstream side, use 1-inch rivets with 8 by 8-inch angles.

Nineteenth. The webs of the diaphragms "A" can be made of one thickness.



Twentieth. In order to maintain a uniform width of girders out to out, it has been decided to mill the stiffeners and bring them to a bearing against flange angles.

Twenty-first. Two bent plates will be used at the end, forming a joint just outside the connecting angles of diaphragm "A" on the upstream side of the leaf. These bent plates will be made of the same thickness as the thinnest sheathing over the air chamber on the downstream side. On the upstream side a filler will be used on these bent plates to make up the thickness used for the thinnest sheathing on this side, this filler only to lay on the face of the leaf. The thicker sheathing plates will be chamfered for about 4 inches where they join these bent plates by one-sixteenth and one-eighth inch, respectively. It has been decided to make the following changes in the sheathing:

79-foot gate, sheathing 8-9, downstream, from five-eighths to eleven-sixteenths inch.

79-foot gate, sheathing 8-9, upstream, from thirteen-sixteenths to seven-eighths inch.

54-foot 8-inch gate, sheathing 6-7, upstream, from eleven-sixteenths to three-fourths inch.

47-foot 4-inch gate, sheathing 6-7, upstream, from eleven-sixteenths to three-fourths inch.

In connection with this the upstream cover of girder 7, on the 54-foot 8-inch gate will be changed from nine-sixteenths to one-half inch.

In order to facilitate the calking of the girder on top of the air chamber, it has been decided to make the sheathing above and below the girder on the top of the air chamber on the downstream side of the same thickness. This will necessitate changing the sheathing above the top of the air chamber in the 77, 79, and 82 foot gates from five-eighths to eleven-sixteenths inch.

Above the air chamber on the upstream side a suitable filler will be used between the cover plate of the girder on top of the air chamber and the sheathing above, and one filler of suitable thickness will be used between the doubling plate above and the sheathing of the air chamber and the wedge sufficiently increased in thickness to make up the balance. On the downstream side the sheathing above the top of the air chamber will be lifted up by means of filler plates between the sheathing and the girders to the plane of the sheathing below the top of the air chamber. These fillers will be from one-sixteenth to one-fourth inch in thickness. Wherever the sheathing below the top of the air chamber changes the thickness, the thinner sheathing will be lifted up by means of a one-sixteenth inch filler to the plane of the heavier sheathing below.

Twenty-second. It will be satisfactory to make the bolts connecting the end connection castings to the leaves squarehead bolts, as long as these heads are on the inside of the leaf. If, on account of the impossibility of inserting these bolts from the inside, the bolthead is to be used on the outside, hexagon heads will have to be used.

Twenty-third. It seems desirable to increase the taper of the wedge to three-eighths or one-half inch, widening the end connection castings accordingly and thickening the sides of the same so that the outside

plates will be parallel with the inside of the sheathing of the air chamber.

Twenty-fourth.—Referring to the planing of the sheared edges, it will be satisfactory to saw the channel intercostals. The angle intercostals up to one-half inch inclusive need not be planed. The connection plates for the intercostals will be ordered UM plates and only the ends indicated planed, the other edges to be neatly sheared.



Referring to the nonwater-tight diaphragm, the clipped corners of the web plates need not be planed; the same applies to the ends of the connection angles.

Referring to the water-tight diaphragms, the short connection angles which are on the noncaulked side will not have to be planed.

Twenty-fifth.—Permission has been granted that in the girders and diaphragms "A," also in skin on the down-stream side, metal up to and including three-fourth inch can be subpunched instead of drilled from the solid. This is with the understanding that good work must be obtained and the holes thoroughly cleaned up in reaming.

Twenty-sixth.—Instead of sand blasting, it will be satisfactory to remove the scale by means of pickling on the skin plates, loose cover plates, splice plates, and similar material. Riveted girders should be cleaned by means of sand blasting.

Twenty-seventh.—It has been decided to make all the end reaction castings one-eighth inch short, using a filler at the joints for caulking. This filler to be varied in thickness if necessary to take care of any variation between the height of the gates and the castings.

Twenty-eighth. To allow for any variation in packing, the non-water-tight frames and end diaphragms "A" and "B" will be made one-fourth-inch short in every fourth panel and fillers one-eighth, three-sixteenths, and one-fourth inch will be provided, thus allowing the water-tight frames to determine the heights of the different girders in the gates.

Twenty-ninth. Where the bent plates come together at the end of the gates, one-fourth-inch clearance will be allowed. The skin plates at the end will make a tight joint with the end bent plates. Where there are two vertical joints in the skin plate in the length of the gate, one-eighth-inch opening will be allowed at each joint, but where there is only one vertical joint, one-fourth inch will be allowed. There will be one-fourth-inch clearance allowed at the horizontal joints of the skin plates. The web plates of girder may set back from flange angles one-eighth inch, one-eighth-inch clearance will be allowed between ends of web plates at splices in girders. On up-stream side above air chamber, the vertical splice plates for skin shall be made one-fourth inch short to allow clearance where they butt against the cover.

Thirtieth. Plates over three-eighths inch in thickness need not have beveled edges for caulking.

Thirty-first. The girders with  $19\frac{1}{4}$ -inch covers and 6 by 6-inch angles will be changed to girders with  $16\frac{1}{2}$ -inch covers and 8 by 8 inch angles.



Thirty-second. It has been agreed upon to ream the connections between all diaphragms and girders full size in the shop to iron templet.

Thirty-third. It will be necessary to change the  $1\frac{1}{2}$ -inch bolts in the wings of end reaction castings to  $1\frac{1}{8}$ -inch rivets along the edge of these wings and  $1\frac{3}{4}$ -inch bolts near the back.

Thirty-fourth. With the adjustments provided, it will be permissible to provide holes in the shop to connect the end reaction castings to the structural work. These holes to be made three-eighths inch smaller than the size of bolts that go through them.

Thirty-fifth. It has been decided to increase the thickness of babbitt between the nickel steel bearing plates and end reaction castings from one-half to five-eighths inch.

Thirty-sixth. In place of the one-half-inch bent plates on the upstream side of girder No. 1, an 8 by 6 by one-half-inch angle will be used, the corners of the same to be neatly rounded to prevent the ropes from cutting.





## REPORT OF COMMITTEE IN DETAIL.

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### PART I.

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#### DRAWINGS.

Circular 576, paragraphs 13, 14, 15, and 16, provides:

13. The "General plans" show the heights and general arrangement of the different gates, the spacing of the horizontal girders, and the vertical frames, etc., and the sizes of shapes and plates used in each leaf.

On the "Detail plans" are shown the shape of the leaf, arrangement of the riveted structural work, including splices, connections, and the numbers and sizes of the rivets and bolts; also the detail of the manholes, the pumping system, the handrailing, and footwalks, etc., and all the important castings and forgings.

These plans refer mainly to the gates 77 feet high, the details applying with slight modifications to the gates of a different height. The special footwalk for lower guard gates is shown separately.

14. From the above drawings and such others in explanation of details or minor modifications of plans as may be furnished him later, the contractor, after the award of the contract, shall prepare all necessary working drawings for the gate leaves and fixed parts, with a detailed calculation of weights.

15. Before any material is ordered or work begun, these working plans must be approved by the chief engineer, or his authorized representatives, and any material ordered or work done by the Contractor prior to the approval of the drawings shall be entirely at his own risk. They shall be submitted in duplicate, one copy of each drawing to be retained by the Commission and the other to be returned to the Contractor approved or with an indication of changes desired. Such approval shall be taken as certifying to the general agreement of the working drawings with the contract plans as to arrangement and sizes of the principal members, but shall not relieve the contractor from full responsibility for the correctness of his shop drawings, for errors in details, such as rivet spacing, clearances, packing of plates, etc., which might interfere with either the strength or appearance of the finished work or with accurate and speedy erection. The Contractor shall be solely responsible for and shall correct, without charge, any mistakes that may be discovered in the work prior to the final acceptance by the Commission.

16. No changes shall be made in any approved plan without the consent in writing of the chief engineer, or his authorized representatives, and the actual work shall conform in every respect to these drawings.

The Commission, however, reserves the right to make any minor changes it may see fit to make in the original contract drawings, the working plans, and the specifications for material and workmanship prior to the final acceptance of any part of the finished material: *Provided, however,* That for any extra expense incurred by the Contractor for material furnished or ordered, drawings made, or work executed prior to the time of receiving notice of such change, he shall be reimbursed at reasonable rates to be fixed, in each case, by agreement between the contracting parties.

Any claim for such changes shall be made by the contractor at the time of the change, or no allowance will be made or money paid on account of same.

The principal witnesses in connection with the way in which the shop drawings were submitted and approved, and as to the delay in connection with the submission of shop drawings and the delay in

their approval, are Mr. Goldmark, Mr. Pendergrass, Mr. Winterbottom, Mr. Wolfel, and Mr. Marshall.

The testimony of Mr. Goldmark, in connection with the approval of shop drawings and what was done to furnish the contractor with the necessary information to enable him to prepare the shop drawings, is found in the report of Mr. Goldmark, marked, for the purposes of reference, Exhibit No. 1, and the testimony of Mr. Goldmark, marked Exhibit (volume) No. 8.

Mr. Wolfel's testimony is found in Exhibit No. 7, volume 7.

Mr. Marshall's testimony is found in Exhibit No. 11, volume 11.

Mr. Pendergrass's and Mr. Winterbottom's testimony is found in Exhibit No. 15, volume 15.

Mr. Goldmark, who was the designing engineer and had charge of the organization and control of the inspecting force which inspected the material for the lock gates, reported at Rankin July 7, 1910, and went over the specifications with a view to determining the manner in which the material would be fabricated.

He remained at Rankin from July 7 until about August 12, 1910. During the time that he was there the agreement of August 8, 1910, was consummated. This agreement is quoted in the appendix to the claim.

By it changes were made in the manner in which the material would be fabricated, which affected the work to be performed under the contract, as claimed by the contractor, by increasing the shop and field cost to the McClintic-Marshall Construction Co. \$172,396, and decreasing the shop and field cost to the McClintic-Marshall Construction Co. \$58,323.

No additional time was claimed for these changes at the time they were made. This change in the cost of the material is shown in Exhibit No. 27, volume 27, in a letter prepared by the McClintic-Marshall Construction Co., dated April 30, 1915.

The entire subject of delay in the performance of the contract was covered in a supplemental agreement entered into the 20th day of May, 1913, which is quoted in full as Exhibit No. 18 of Mr. Goldmark's testimony, General Exhibit No. 8, volume No. 8.

At the time of making this agreement all of the delay in the preparation of the working drawings and the furnishing of data in connection therewith, that could have affected the contractor, had taken place.

This agreement was more or less of a compromise. It states that:

Whereas the contractor is entitled to a considerable part of the additional time it claims; and

Whereas the allowance of any considerable length of time for completion of the lower guard gates at Gatun, the lower guard gates at Miraflores, and certain other gates the completion of which is necessary in order to permit any use of the canal, will delay the completion and opening of the canal long past the essential dates determined on by the Commission, and will otherwise greatly damage the Commission by interfering with the orderly prosecution of other work now under contract and thereafter to be done by the Commission; and

Whereas it will be difficult to determine the exact time that should be allowed upon the claims made by the contractor.

The Contractors summarized their claims for delays prior to the making of this supplemental contract as shown in blue prints marked "Exhibits A and B" and introduced as Exhibits Nos. 1 and 2 in



the testimony of Col. Jervay (General Exhibit 24), volume 24. From the blue print marked "A," it appears that there was a claim for additional time on account of delay headed "Drawings and ordering material for water-tight frames," 114 days, applicable to all gates, or all the work; changes in skin of 77-foot leaves, 7 days, applicable to all locks; air-tight pump chamber, pumping system, and mitering devices, 23 days, applicable to all locks; further changes in manhole covers, vertical hinge, groove added for rubber, 28 days, applicable to all gates except the 54-foot-8-inch gates; delay in approving drawings for 66-foot and 82-foot leaves, applicable only to those leaves, 75 days.

In this claim for additional time, all of the delays above claimed are indicated by a star as being cumulative.

Exhibits A and B, with the initials "H. G.," being the initials of Mr. Henry Goldmark, Exhibits 141 and 142 of the testimony taken on the Isthmus (General Exhibit No. 32), volume 32 (see Isthmus Exhibit, vol. 31), give the amount of time that should be allowed for the causes specified above, as apparently approved by Mr. Goldmark, as follows:

Drawings and ordering material for water-tight frames, 50 days.

Nothing for the change in skin of 77-foot leaves.

Air-tight pump chamber, pumping system, and mitering device, 23 days.

Nothing for changes in manhole cover, vertical hinge, groove added for rubber.

Delay in approving drawings for 66-foot and 82-foot leaves, 75 days.

The delay of 50 days in drawings and ordering material for water-tight frames is marked "Cumulative."

The delay for the 66-foot and 82-foot leaves is marked "Cumulative."

These two exhibits show that the delay due to the failure to furnish the necessary data to enable the Contractor to prepare the working drawings was taken into consideration in connection with the making of the supplemental agreement.

It seems to your committee that, to the extent to which the causes of delay were adjudicated in the making of the supplemental agreement, that agreement should be held to be conclusive and binding upon the parties to the contract. To the extent to which there are causes of delay which were not considered and which were not adjudicated in the supplemental agreement, there probably should be additional time allowed, and the claim adjudicated upon the basis of the allowance of such additional time.

There are some causes of delay which do not appear to have been taken into consideration and adjudicated in the making of the supplemental agreement.

Some of these alleged causes are: Unreasonable demands of the Commission's inspectors; delays from failure to promptly decide questions in relation to inspection; delays in inspecting material; and such delays as may have resulted from a change in the size of the subpunched holes.

These alleged causes of delays will be considered first in connection with claim No. 2 of the Contractor, for increased cost of fabrication of the material.

The claim of the Contractor for extra cost of working drawings due to delay in furnishing complete designs and data for changes made, and in approval of working drawings, does not appear to have been adjudicated and settled in the supplemental agreement.

If this was strictly a legal claim, the Contractor would be concluded under the terms of the contract from asserting any claim for increased cost due to changes he was required to make in the drawings.

Article 4 of the contract provides for minor changes and contains this provision:

That for any extra expense incurred by the Contractor for material furnished or ordered, drawings made, or work executed prior to the time of receiving notice of such change, the Contractor shall be reimbursed at reasonable rates, to be fixed in any case by agreement between the contracting parties. Any claim for such changes shall be made by the Contractor at the time of the change or no allowance will be made or money paid on account of the same.

The act of Congress, however, makes it the duty, in reporting upon this claim, to ascertain—

What amount, if any, is in justice, equity, and fairness due and owing to the said McClintic-Marshall Construction Company from the Isthmian Canal Commission for work and labor done and material furnished in connection with the construction of the lock gates and appurtenances for the Panama Canal \* \* \* taking into consideration the claim of the Contractor that the work was done under requirements, as to character and finish, not fairly within the meaning of the specifications.

There were many changes made in the design, and these changes did increase the cost of the shop drawings to the Contractor.

The original estimate of the Contractor for drawing charge was eight-tenths of 1 cent a hundred, or a total of \$8,557. (See original estimate attached to Mr. Marshall's testimony, General Exhibit No. 11, volume 11.) The cost to the Contractor for drawings was 1.9 cents a hundred, or \$20,051. (See General Exhibit No. 26, giving the total shop cost and analysis of expenses incurred in the United States and on the Isthmus.)

The manner in which the amount of the claim of \$8.890 was arrived at is shown in an estimate prepared by Mr. R. A. Pendergrass, the engineer in charge of the preparation of drawings for the McClintic-Marshall Construction Co. This estimate is dated April 27, 1915, and was submitted as a part of the data compiled from the books of the Contractor at Rankin, between April 11, 1915, and May 1, 1915, General Exhibit No. 27, volume 27. For ready reference a copy of this estimate is attached to this report and marked "Appendix A."

Under this estimate it appears that prior to August 8, 1910, there had been charged against drawings a little over \$600. It is stated that it is safe to assume that at that time they had spent \$700.

In addition to this it is assumed by the Contractor that the lack of information in the beginning to prepare the drawings probably increased the cost of the drawings approximately 5 per cent.

The Contractor claims that the entire \$700 expense that had been charged to drawings prior to August 8, 1910, was a loss to him, and that he should be reimbursed therefor. He claims, in addition to this, an estimated loss due to lack of information of \$1,000, which would make \$1,700.



In addition to this he makes a detailed explanation of the claim, as follows:

1. Change in pump chamber as outlined on page 24 of Appendix: This change required the making over after having been once completed of drawings 1-B to 5-B, inclusive, and considerable changes on sheets 3-A, 4-A, 5-A, 6 to 18, inclusive, 22, 47, 98, and 99. This change therefore required making over 5 sheets which we have estimated to cost \$45 each, and the revising of 20 sheets the cost of which we have estimated to be \$400, or a total of \$625.

2. Change in gauges as outlined on page 34 of Appendix. This required changes on the following drawings: 3-A, 3-B, 4-A, 4-B, 5-A, 5-B, 6 to 18, inclusive; 47 to 64, inclusive; 73 to 78, inclusive; 81, 82, 84, 107, 108, 124, 127, and 129, or a total of 51 drawings in all. The cost of revising these drawings we have estimated at \$10 each, or a total of \$510.

3. Changes in air vent as outlined on page 27 of Appendix: This required revisions on drawings 3-A, 3-B, 4-A, 4-B, 5-A, 5-B, and 6 to 13, inclusive, or a total of 14 drawings, the cost of revising of which we have estimated to be \$15 per sheet, or a total of \$210.

4. Change in manhole frames as outlined on page 20 of Appendix: This required revising drawings 115 and 116 and the making of two new drawings 137 and 138. We have estimated the cost of revising the two drawings to be \$30 and the cost of making two new drawings \$90, or a total of \$120.

5. Change in mitering mechanism as outlined on page 32 of Appendix: This required the revising of drawings 119, 120, 121, 123, 20-B, 20-C, and 97, a total of seven drawings, the cost of revising of which we have estimated at \$15 each, or a total of \$105.

6. Adding bent angles at top of air chamber as outlined on page 30 of Appendix: This required revisions on drawings 12 and 13; we estimate cost of same to be \$30.

7. Changes in sheathing plates as outlined on page 32 of Appendix: This required the revision of drawings 37 to 45, inclusive; 28, 34, 35, 22, 23, 24, 25, 28, 1-A, 1-B, 47, 48, 49, 50, 51, 52, and 55 to 60, inclusive; also the making over of drawings 36, 26, 27, 29, and 61; also the making of additional drawings 146, 147, 148, 149, 150, and 151. The additional work required for this change is therefore represented by the revision of 31 drawings, making over of 5 drawings, and making 6 new drawings, and the total cost of this we estimate to be \$805.

8. Mr. Hammer borrowed from us a man to prepare design drawings of manhole covers and frames, according to the ideas of himself and Mr. Guynn, as mentioned on page 4 of Appendix. He prepared I. C. C. drawings 201 to 210, inclusive, a total of nine drawings at an estimated cost of \$20 each or \$180.

9. After a drawing had been submitted for approval, showing the curb for lower guard gate made of cast iron as shown on design, Mr. Hammer requested that this be entirely changed, using structural steel instead of cast iron, which required the making of one additional drawing at the estimated cost of \$45. The number of this drawing was 178.

10. A considerable amount of time was spent by the writer with Mr. Hammer in experimenting on and testing out different styles of gaskets for manhole covers. We believe that the drafting room spent probably \$100 on this work, which does not include that part of the cost of this experimenting which was charged against the shop pay roll.

11. The work in the drafting room was delayed and the expense thereof increased on account of the delay in approval of drawings as outlined on pages 34 to 40, inclusive, of Appendix. This delay in the approval, particularly of the latter contracts, necessitated keeping draftsmen on this contract longer than would have been otherwise necessary. This amounted to considerable, as the drawings for the 66-foot gates were not approved for about 11 months after they had been submitted. The delay in approving these drawings, as well as those for the 82-foot gate, delayed any action upon the working up of spare parts. We pushed Mr. Hammer for the approval of the drawings for these two particular contracts, and not obtaining very much satisfaction, Mr. McClintic wrote to Mr. Goldmark, as mentioned on page 37 of Appendix. This delay resulted in increased cost in getting out the spare parts on account of the length of time which had elapsed since the drawings for the gates had been made. We believe that while it is questionable how much the cost of these delays in approving the drawings amounted to, yet it would not be unfair to assume that this would probably equal 5 per cent of the total cost of the drawings, or in the neighborhood of \$1,000.



The specifications and contract called for the contractor to furnish erection diagrams showing the application of the spare parts to the various gates, but did not require them to determine what spare parts would actually be required, except that in general these spare parts would consist of a complete 82-foot gate and a few other pieces for a 79-foot gate. We approached Mr. Hammer several times for more definite information as to exactly what spare parts were to be used, and finally got from him a general idea of what was wanted. This, however, was verbal, and was given only in a very general way, and necessitated our taking one of the men who had checked a great deal of this work off from the work on which he was engaged to go into this matter in detail and prepare list of spare parts which should be used. This matter was gone over with Mr. Hammer and revised, and after a considerable length of time we received the final information as to exactly what parts we were to furnish. The expense of all of this work, which we believe was not a part of our contract, would amount to probably \$250. In addition to this work on the spare parts, Mr. Hammer insisted that we field check over all of the pieces furnished as spare parts to make sure that they would match up and build up the gates as required. This required the services of two of the highest-priced men that had been used for this work for a period of several weeks, at a cost of at least \$300. This was required of us by Mr. Hammer after we thought we had all of the work required for the spare parts entirely finished.

When the drawings were ready for approval prints of the same were submitted to Mr. Hammer. However, he took practically no action on such prints unless he had the man in charge of the squad at his elbow to assist him in going over these details and to answer any questions which he might raise. This work was constantly interrupted by Mr. Hammer's time being taken for other work. This same thing was true in securing his approval of tables of quantities and weights and field rivets. It was also Mr. Hammer's practice to call upon this same man whenever questions came up in regard to details as relating to shop work, field work, material, or shipping weights, so that we believe we are safe in saying that at least one-half of this man's time was spent in Mr. Hammer's office instead of in the drafting room. This not only took up his time, but had an indirect effect in increasing the cost of drawings on account of his absence from the squad of men over which he had charge. The first drawings were submitted for approval September 17, 1910, and the last drawings, not including the spare parts, were finally approved March 18, 1912, approximately 18 months. Assuming that at least one-half of this time was spent in Mr. Hammer's office, it would appear that the cost of the drawings was therefore increased at least \$1,500 and possibly as much as \$2,000.

We give below a summary of these various amounts:

Lost time at the start.....	\$700
Delays on account of information.....	1, 000
Change in pump chamber.....	625
Change in gauges.....	510
Changes in air vent.....	210
Change in manhole frames.....	120
Change in mitering mechanism.....	105
Addition of bent angles top of air chamber.....	30
Change in sheathing plates.....	805
Man loaned to Mr. Hammer.....	180
Change in cast-iron curbs.....	45
Experimenting with manhole covers.....	100
Delay in approving drawings.....	1, 000
Extra work on spare parts.....	550
Man in Mr. Hammer's office.....	1, 500

This total amount as given above is \$7,480, instead of \$8,890, as given in the claim. The reason for this discrepancy is due to the fact that, as previously stated, this list is not completed, and also because the amount of the claim was arrived at in a different manner, as follows:

There was a total of 187 shop drawings, 48 diagrams, and 55 shop drawings made by our subcontractors. To determine the amount of the claim it would seem that the most reasonable way is to estimate what we consider as a fair and liberal amount for making these drawings and that the difference between this amount and what they actually cost would be the cost of the delays, changes, etc. We have records showing that the average cost of drawings for



a considerable length of time was \$37 per sheet. This was an average of all the drawings made by us over a considerable period, including erection diagrams. Some of these drawings were much simpler than the lock gates, and some more complicated. On the lock gates the diagrams for the first gate were rather expensive, but after that they were made very cheaply. The drawings made by the subcontractors were checked by us and certain time was spent in giving them information, such as the spacing of holes to connect to steel-work. We have therefore estimated a liberal amount, figured as follows:

187 shop details, at \$45 per sheet-----	\$8,415
48 diagrams, at \$30 per sheet-----	1,440
55 subcontractors' drawings, at \$25 per sheet-----	1,375

or a total of \$11,230, as against the original estimate of \$8,200, and against the actual cost of \$19,403. In obtaining the amount of the claim we took the difference between the actual cost of \$19,403 and the amount of our last estimate of \$11,230, or \$8,173, and added to this a profit of \$717, or a total of \$8,890.

Mr. Pendergrass was also examined as to the reasonableness of these charges when his testimony was taken at Rankin June 26 and 30 and July 2 and 3, and he stated (General Exhibit No. 15, vol. 15, Pendergrass's testimony, p. 87), in response to a question:

Have you any reason to change the estimate that you made at the time I was here in Pittsburgh?

which question referred to the estimate above given—

A. Yes, sir. Under change in pump chamber, claim C-3, I stated that this change required the making over of 5 drawings and the revising of 20. Since making that statement to you, I have found a note of Mr. Froessel, who at that time was in charge of the shop drawings, dated October 31, 1910, in which he stated that this change required the making over of 6 drawings, and the revision of 28. That is the only correction that I have to make.

It is very difficult at this time to determine with any degree of accuracy just what part of the extra expense in connection with the drawings should be charged to the Commission. Early in the work, on October 25, 1910, Mr. Hammer called the attention of Mr. Wolfel to the fact that subcontractors were not making the corrections which he found necessary on account of errors on their part, and for other reasons. He states in this letter that—

In some instances blue prints showing the same castings have been reviewed and corrected three times by myself before I found that the corrections had been properly made. This unnecessary checking of drawings, and the unsatisfactory way in which corrections have been made, has taken up altogether too much of my time, to the detriment and delay of other work that needed my attention; for instance, the approval of shop drawings for the structural work.

It also appears that, as to at least one of the charges, that as to the manhole covers, it was understood at the time that the change was made that there was to be no additional charge allowed, and no claim made for delay.

The following correspondence on this subject shows the agreement that was reached in connection with changes in the drawings for the manhole covers:

On February 15, 1911, Mr. Hammer cabled to the Isthmus as follows:

Please cable Goldmark Contractor willing to manufacture manholes as per sketch 209, for original unit price; no extra. Recommend keeping Guynn here until first leaf assembled complete, to familiarize himself with all particulars. Otherwise let him go to Isthmus when first shipment leaves Baltimore.

On February 28, 1911, the following cable was sent:

Please cable Goldmark, referring to your cable of 17th, Contractors agree in letter of yesterday to provide manhole covers in accordance with sketch 209, now revised and given No. 210. The cost will be original unit price; no extra cost; and no delay will be claimed if change adopted without delay.

On March 1, 1911, Mr. Hammer received the following cable:

For Mr. Hammer, referring to your cable of 19th ultimo, manhole covers, change authorized on understanding as stated.

Under the terms of the contract the Contractor was required to familiarize himself with the work, and to prepare detailed drawings. It does not seem to your committee, therefore, that the entire amount of \$700 which the Contractor claims to have spent prior to the agreement of August 8, 1910, should be charged to the Commission. It is difficult to make an estimate as to the amount of this charge that should be assumed by the Commission, due to the lack of information. It seems to your committee to be fair and reasonable that this charge should be divided, and one-half assumed by the Commission and one-half borne by the Contractor.

The estimate of 5 per cent for increase in the cost of drawings, due to the lack of information, is probably too high, and is reduced to \$600.

The estimate for changes, item No. 1, seems to be reasonable and should be allowed.

The estimate in item No. 2, the same.

The estimate for item 3 should be allowed, as well as the estimate for item 4.

The estimate for item 5 should be allowed.

The estimate for item 6 seems to be reasonable and should be allowed.

The estimate for item 7 should be allowed.

Item No. 8 appears to be an estimate for services that were furnished to Mr. Hammer. These services, under the agreement as shown in the cablegrams above quoted, are not a proper legal charge against the Panama Canal. It is my opinion, however, that as the Commission had the benefit of the services, and as the design was undoubtedly improved by reason of such services, this item should be allowed.

Item No. 9 is reasonable and should be allowed.

Item No. 10 appears to cover an expenditure that was made with a view to improving the design, and should be allowed.

Item 11. There was undoubtedly some delay in approving the drawings referred to in this item, and it must have cost the Contractor some money. There is no way of arriving at the exact amount that should be allowed for this item. The Contractor does not seem to be able to give anything more than an estimate of the cost that he was put to on account of the delay in the approval of the drawings; and it does not seem to me probable that the amount of expense that he was put to on that account could have equaled 5 per cent of the total cost of the drawings. I think probably \$600 will cover all equitable claims that the Contractor has on account of the delays in the approval of drawings shown under this item.

I think the estimate for extra work in connection with the spare parts should be allowed. The estimate that at least one-half of the time of a high-priced man for 18 months was spent with Mr. Ham-



mer in approving drawings seems to me to be unreasonably high. It must be considered that it was the duty of the Contractor to give Mr. Hammer such information in connection with the drawings as was necessary for him to properly check them. If doubtful points appeared in the drawings, it was natural and proper for Mr. Hammer to call upon the Contractor for the services of some one to explain the doubtful points. It is probable from the testimony that Mr. Hammer utilized the services of the employees of the McClintic-Marshall Construction Co. to excess in connection with the checking of the drawings; and I think that it will be fair and just to assume that one-half of the estimate made would cover the services of such employee for such extra time as he gave to Mr. Hammer in connection with the approval of the drawings.

This claim should, therefore, be allowed in the following amounts:

Lost time at the start	\$350
Delays on account of information	600
Change in pump chamber	625
Change in gauges	510
Changes in air vent	210
Change in manhole frames	120
Change in mitering mechanism	105
Addition of bent angles, top of air chamber	30
Change in sheathing plates	805
Man loaned to Mr. Hammer	180
Change in cast-iron curbs	45
Experimenting with manhole covers	100
Delay in approving drawings	600
Extra work on spare parts	550
Man in Mr. Hammer's office (loaned)	750
Total	5,580

### CLAIM NO. 2.

The second claim of the Contractor is as follows:

Increased cost of fabrication, due to delay in furnishing the Contractors the necessary data, unfair demands of the Commission's engineers, and unreasonable shop inspection, \$320,892.

In arriving at the amount of this claim the Contractor states that the shop labor and surcharge on the lock gates was over \$4 per ton higher than the average cost of all the work turned out in the same shop in the preceding year and the year succeeding the fabrication of the lock gates. He also states that this work should have been done at about \$2 per ton less than the average cost of all the work for the preceding and succeeding years, for the reason that there was so much duplication in the work and such a large proportion of the work simply punched and drilled, without being assembled or riveted.

In this way he arrives at the conclusion that the loss due to the unreasonable demands of the engineers and inspectors of the Isthmian Canal Commission is \$6 a ton on 53,482 tons of material.

The first question to be determined in connection with the investigation of this claim is, whether or not it is a fact that the fabrication of the lock-gate material cost \$4 a ton more than the average cost for fabricating material of the same or similar character in shop No. 2 at Rankin.

The next question to be determined is, whether or not it should have been fabricated at \$2 a ton less than other material of similar character being fabricated in shop No. 2.

With a view to determining, as nearly as possible, how the cost of fabrication of this material compared with the cost of fabricating other material that was fabricated in shop No. 2, such data was obtained from the McClintic-Marshall Construction Co. as they were able to furnish indicating the cost of fabricating material in shop No. 2 for the period from December 9, 1909, to November 30, 1910, inclusive; the cost of fabricating all material that was fabricated in shop No. 2 during the period from December, 1910, to January, 1913, inclusive; and also the cost of fabricating material in shop No. 2 from February, 1913, to January 30, 1914, inclusive. (See vol. 26, general expenses, 26.)

An examination of the books of the McClintic-Marshall Construction Co. discloses the fact that the departmental shop cost and the general expenses of shops Nos. 1 and 2, at Rankin, are so intimately connected with each other and so kept that it is hard to segregate them with any degree of accuracy or certainty. (See vol. 27, Rankin data.)

From the data furnished by the Contractor, and an examination of his books, it appears that the manufacturing cost and the general expense, as shown by the records of the McClintic-Marshall Construction Co., for the period from December, 1909, to November, 1910, inclusive, and for the period from December, 1910, to January, 1913, inclusive, and for the period from February, 1913, to January, 1914, inclusive, were as follows:

	Tons.	Manufacturing cost.	Per ton.
Shop 2, lock gate.....	53,943	\$474,161.54	\$8.79
Shop 2, other material.....	14,002	114,883.68	8.19
Shop 1, material.....	58,406	429,894.39	7.36
	126,351	.....	.....

General expenses—103.6 per cent of \$474,161.53 is \$491,231.35.

*Lock-gate material general expenses.*

	Tons.	General expense.	Per ton.
Shop 2, lock gate.....	53,943	\$491,231.35	\$9.10
Shop 2, other material.....	14,002	119,019.49	8.50
Shop 1, material.....	58,406	445,099.41	7.62

Total expense manufacturing lock-gate materials:	Per ton.	
Manufacturing .....	\$8.79	
General expenses .....	9.10	
Total .....		Per ton.
		\$17.89
Total expense other material passing through shop 2 at same time:		
Manufacturing .....	8.19	
General expenses .....	8.50	
Total .....		16.69
Difference.....		1.20



Total manufacturing expenses, shops 1 and 2, compared:		Per ton.
Shop 2, 67,945 tons, manufacturing cost, total \$589,045.22-----		\$8. 67
Shop 1, 58,406 tons, manufacturing cost, total \$429,894.39-----		7. 36
Difference-----		1. 31
		<hr/>
Shop 2, 67,945 tons, general expenses, cost, \$610,250.84-----		8. 98
Shop 1, 58,408 tons, general expenses, cost, \$445,099.41-----		7. 62
Difference-----		1. 36
		<hr/>
Shop 2:	Per ton.	
Total manufacturing cost-----	\$8. 67	
General expenses-----	8. 98	
Total cost-----		17. 65
Shop 1:		
Total manufacturing cost-----	7. 36	
General expenses-----	7. 62	
Total cost-----		14. 98
Difference-----		2. 67
		<hr/>
Difference between manufacturing cost of lock gate and material shop 1 is-----		1. 43
Difference between general expenses of lock gate and material shop 1 is-----		1. 48
Total difference-----		2. 91
Difference in cost of manufacturing of lock-gate material and other material going through shop 2 at same time is, per ton-----		1. 20
Difference between cost of manufacturing lock-gate material and material in shop 1 at same period is, per ton-----		2. 91
Difference between shop cost in shops 1 and 2 for all material, lock-gate period, is, per ton-----		2. 67
		<hr/>
The output of shops 1 and 2 were as follows for the period—		
From 1909 to 1910:		Tons.
Shop 1-----		39, 746
Shop 2-----		44, 419
Total-----		84, 165
From 1913 to 1914:		
Shop 1-----		33, 479
Shop 2-----		38, 917
Total-----		72, 396
Total manufacturing expenses from 1909 to 1910, shops 1 and 2----	\$529, 464. 97	
Total manufacturing expenses from 1913 to 1914, shops 1 and 2----	501, 228. 84	
		<hr/>
Total manufacturing cost from 1909 to 1910, shops 1 and 2, \$529,464.97, divided by 84,165, equals, per ton-----		6. 39
Manufacturing cost 1913 to 1914, shops 1 and 2, \$501,228.84, divided by 72,396 tons, equals, per ton-----		6. 91
Manufacturing cost, shop 2, 1909 to 1910, \$262,391.02, divided by 44,419 tons, equals, per ton-----		5. 91
Manufacturing cost, shop 1, 1909 to 1910, \$267,063.95, divided by 39,746 tons, equals, per ton-----		6. 97
Manufacturing cost of shop 2, 1913 to 1914, \$255,505.15, divided by 38,417 tons, equals, per ton-----		6. 65
Manufacturing cost of shop 1, 1913 to 1914, \$245,723.69, divided by 33,981 tons, equals, per ton-----		7. 23
Average manufacturing cost per ton-----		6. 58
		<hr/>

General expenses of shops 1 and 2 from 1909 to 1910 equals 83.1 per cent of \$529,464.97, or-----	\$440, 197. 99
General expenses of shops 1 and 2 from 1913 to 1914 equals 99.9 per cent of \$501,228.84, or-----	500, 827. 23
General expenses of shops 1 and 2 from 1909 to 1910 equals \$440,197.99, divided by 84,165, equals, per ton-----	5. 23
General expenses of shops 1 and 2 from 1913 to 1914 equals \$500,827.23, divided by 72,396, equals, per ton-----	6. 91
General expenses for shop 2 from 1909 to 1910 equals 83.1 per cent of \$262,391.02, or \$218,046.94, divided by 44,419, equals, per ton--	4. 91
General expenses for shop 1 from 1909 to 1910 equals \$221, 930. 44, divided by 39,762 tons, or, per ton-----	5. 58
General expenses, 1913 to 1914, shop 2, equals 99.9 per cent of \$255,505.15, or \$255,249.64, divided by 38,417, equals, per ton----	6. 64
General expenses shop 1, 1913 to 1914, equals \$266,551.02, divided by 33,981, equals, per ton-----	7. 23
The average general expense per ton is-----	6. 08

The above computations were made from data contained in volumes 26 and 27 of the evidence.

The average cost per ton, including manufacturing cost and general expense for all material that passed through Rankin shops Nos. 1 and 2 for the period from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, was \$12.59 a ton. This average cost is found by dividing the total charge for manufacturing cost plus the total charge for general expenses by the total tonnage for the period. The manufacturing labor costs, \$1,030,693.81, plus the general expense of \$941,025.22, equals \$1,971,719.03 as the total expense for the two periods named; \$1,971,719.03 divided by 156,561, the total tonnage for the period, gives an average tonnage price of \$12.59 for all material passing through shops 1 and 2 for the periods named.

The average cost per ton, including manufacturing cost and general expense of material passing through shops 1 and 2, 1909 to 1910, is \$11.52. This is found by dividing the total expense of \$969,682.96 by the total tonnage, 84,165.

The average cost per ton, including manufacturing cost and general expense of all material that passed through shops 1 and 2 for the period from February, 1913, to January, 1914, inclusive, was \$13.84. This is found by dividing the total manufacturing and general expense cost of \$1,002,056.07 by the total tonnage of 72,396.

The total departmental shop cost for shop No. 2, 1909 to 1910, was \$262,391.02. The general expenses are not given by the claimant. The general expenses for this period, however, were 83.1 per cent of the departmental shop cost; 83.1 per cent of \$262,391.02 equals \$218,001.93, the general expenses for shop No. 2 for this period, giving the total general and departmental shop cost as \$480,392.95. This, divided by the total tonnage of 44,419, gives an average departmental and general expense cost per ton of \$10.82.

The departmental shop cost for shop No. 2, 1913 to 1914, is given as \$255,505.15. The general expenses for shop No. 2 are included in the general expenses as given for shop No. 1. The percentage of general expenses for shops Nos. 1 and 2 for the period from 1913 to 1914 is 99.9 per cent of the departmental shop cost; 99.9 per cent of \$255,505.15 equals \$255,249.66 as the general expenses of shop No. 2 for the period from February, 1913, to January, 1914, inclusive.



The amount of these two sums divided by the total tonnage of shop No. 2 for this period, 38,417, gives \$13.29 as the total expenses per ton for fabricating material in shop No. 2 for the period named. The total departmental cost and general expenses for shop No. 2 for the periods from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, was \$991,197.33. The total tonnage for shop No. 2 for the periods named was 82,836. The total expense divided by the total tonnage gives \$11.97 a ton as the average cost of fabricating material in shop No. 2 for the periods named.

If we should add the tonnage price for each period named and divide by 2 it would give \$12.05 a ton. It must therefore be considered as established that the average cost of fabricating material in shop No. 2 for these periods was at least \$12 a ton.

The total cost of fabricating all materials other than lock-gate material passing through shops Nos. 1 and 2 for the period from December, 1909, to January, 1914, inclusive, was \$3,080,716. The total tonnage of such material was 228,969 tons. The total cost shown divided by this tonnage gives \$13.45 as the cost per ton for fabricating all material other than lock-gate material in shops Nos. 1 and 2 for the period stated.

As a possible basis of comparison of shop cost of lock-gate material with other material the tonnage prices are shown in the table below:

	Per ton.
Departmental and general expenses, 1909 to 1910, shop No. 2-----	\$10. 82
Departmental cost and general expenses, shop No. 2, 1913 to 1914-----	13. 29
Departmental cost and general expenses, shop No. 2, for the periods December, 1909, to November, 1910, and February, 1913, to January, 1914--	11. 98
Departmental shop cost and general expenses for all material other than lock-gate material passing through shops Nos. 1 and 2 for the period from December, 1909, to January, 1914, inclusive-----	13. 45
Departmental shop cost and general expenses, shops 1 and 2, for the periods from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive-----	12. 59
Departmental shop cost and general expenses, shops 1 and 2, for the period from December, 1909, to November, 1910, inclusive-----	11. 52
Departmental shop cost and general expenses, shops 1 and 2, for the period from February, 1913, to January, 1914, inclusive-----	13. 84
Departmental shop cost and general expenses of material passing through shop 1 from December, 1909, to January, 1914, inclusive-----	14. 10
Departmental shop cost and general expenses of material passing through shop 1, lock-gate period-----	14. 98
Departmental shop cost and general expenses, shop 2, for all material passing through the shop other than lock-gate material during lock-gate period-----	16. 69

If we should add the prices for material per ton shown in the above table together and divide the total by the number of prices established, it would give us an average price per ton of \$13.32 for all material passing through shops 1 and 2, exclusive of lock-gate material, from December, 1909, to January, 1914, inclusive. The actual shop cost and general expenses for all material, other than lock-gate material, divided by the number of tons passing through shops 1 and 2 for the period from December, 1909, to January, 1914, inclusive, however, gives an average tonnage price of \$13.45.

It will be noted from this table that the lowest departmental shop cost and general expense for any period is in shop No. 2, from 1909



to 1910. It will also be noted that the shop cost and general expenses in shop 1 are higher than in shop 2 for all periods of comparison except the lock-gate period. It will also be noted that the departmental shop cost and general expenses in shop 2 from February, 1913, to January, 1914, inclusive, are \$2.45 a ton higher than the departmental shop cost and general expenses of shop 2 for the period from December, 1909, to November, 1910, inclusive. In their analysis of the total shop cost and general expenses incurred in the United States, General Exhibit No. 26, the claimants do not attempt to give the departmental shop cost of shop No. 1, neither do they attempt in the data furnished during the examination of their books, Exhibit No. 27, to segregate the general expenses that are applicable to shops 1 and 2. It would seem, therefore, that in establishing a tonnage price for the fabrication of material other than lock-gate material that all of the material passing through shops 1 and 2 for the period from December, 1909, to January, 1914, inclusive, other than lock-gate material, should be taken into consideration. If this is to be taken as the right basis of comparison, then the average tonnage price of all material passing through shops 1 and 2, exclusive of lock-gate material, for the 50 months from December, 1909, to January, 1914, inclusive, was \$13.45. This would eliminate as many of the unknown quantities as is possible under the records that have been kept by the McClintic-Marshall Construction Co. There would still remain some uncertainty as to the correctness of the charge that has been applied as general expenses to the lock-gate material. It is the opinion of your committee, however, that it would be fair and reasonable, in view of the state of the records, to fix the price at which all other material in shops 1 and 2 was fabricated during the lock-gate period, and for the year preceding and the year succeeding the lock-gate period, at \$13.45 a ton, and that this would seem to be a reasonable normal price with which the fabrication of the lock-gate material might be compared.

If this is to be taken as a basis of comparison, then the lock-gate material on the record furnished cost \$4.44 a ton more to fabricate than all other material passing through shops Nos. 1 and 2 at Rankin during the period from December, 1909, to January, 1914, inclusive. The Contractor's claim, however, is based upon a comparison of lock-gate material with all material passing through shop No. 2 for the periods from December, 1909, to January, 1910, inclusive, and from February, 1913, to January, 1914, inclusive. On the data furnished the departmental shop cost and general expenses for shop No. 2 for period stated is \$991,197.33, and the output is 82,836 tons. The average price per ton is \$11.97. Upon this basis the lock-gate material cost \$5.92 more than all material passing through shop No. 2 for the periods from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive. During this period the departmental shop cost and general expenses in shop No. 1 was \$13.28 a ton. Compared with this the lock-gate material cost \$4.61 a ton more than all material going through shop No. 1 from December, 1909, to November, 1910, and from February, 1913, to January, 1914, inclusive. There is, however, no charge for depreciation for the months of December, 1909, and January, 1910. In the way in which the average cost is arrived at this would affect



the cost per ton for the entire periods from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive. The error amounts to 6 cents per ton. This added to \$11.97 would make the cost per ton for fabricating material passing through shop No. 2 for the period from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, \$12.03. Twelve dollars and three cents is therefore the very lowest average price for the fabrication of material in shop No. 2 with which it would be just to compare the cost of fabricating the lock-gate material. Taking this as the average cost per ton for fabricating material in shop No. 2 for the period from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, the lock-gate material cost \$5.86 per ton more than the average cost of fabricating all other material passing through shop No. 2 for the periods stated.

It is a fact, therefore, on the record furnished the departmental shop cost and general expenses for fabricating the lock-gate material were at least \$4 a ton higher than the average cost of fabricating all other material turned out of shops Nos. 1 and 2 for the period from December, 1909, to January, 1914, inclusive, and that it was considerably over \$4 per ton higher than the average shop cost of all material turned out of shop No. 2 for periods from December, 1909, to November, 1910, and from February, 1913, to January, 1914, as claimed on pages 68 and 69 of the claim. Compared with all other material passing through shops Nos. 1 and 2 for the period from December, 1909, to January, 1914, inclusive, the excess cost of fabricating the lock-gate material was \$4.44 a ton. Compared with material passing through shop No. 2 for the period from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, the excess of cost of fabricating the lock-gate material was \$5.86 per ton.

The above determinations as to excess cost in shop cost of the lock-gate material over all material passing through shop No. 2 from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, and of all material passing through shops 1 and 2 for the period from December, 1909, to January, 1914, inclusive, are based upon a departmental shop cost and general expenses for the lock-gate material of \$17.89 a ton, and on a tonnage for the lock-gate material of 53.943 tons.

The McClintic-Marshall Construction Co. did not give the tonnage upon which the departmental shop cost for the lock-gate material was based, and the tonnage has been arrived at by dividing the total cost by the cost per ton shown. The total tonnage in the departmental shop-cost record furnished of material passing through shop 2 other than lock-gate material is not given. (See vol. 26 of the evidence.)

The average departmental shop cost per ton for material other than lock-gate material fabricated in shop 2 from December, 1910, to January, 1913, inclusive, was \$8.19 a ton. The total departmental shop cost for fabricating such material was \$114,863.68. This divided by 8.19 would give the number of tons, other than lock-gate material, fabricated in shop 2 as 14,002 tons. This 14,002 tons includes the fabrication of the lock-gate material lost on the steamship *Moldegaard*, November 24, 1911.



The total material fabricated in shop 2 during the lock-gate period, as shown by the records of the McClintic-Marshall Construction Co., was 67,945 tons. This is 1,324 tons more than as shown in the claim (see p. 72 of the claim).

The total amount of material fabricated in shops 1 and 2 for the period from December, 1910, to January, 1913, inclusive, was 126,351 tons.

It appears, therefore, that the material fabricated in shops 1 and 2 for the period from December, 1910, to January, 1913, inclusive, was as follows:

	Tons.
Lock-gate material under original contract passing through shop 2----	53, 943
Material other than lock-gate material and replace material, lost on the steamship <i>Moldegaard</i> , passing through shop 2-----	14, 002
Material fabricated in shop 1 for this period-----	58, 406
	126, 351

The tonnage price of fabricating the lock-gate material was increased by reason of the fact that there was a reduction in the output of shop No. 1 during the lock-gate period almost equal to the reduction in output of shop during the fabrication of lock-gate material. It was also increased by reason of the fact that there were breakdowns in the power house of the McClintic-Marshall Construction Co. during the months of July, August, and September, 1912.

For the period from December, 1909, to November, 1910, inclusive, the output of shop No. 1 was 47.22 per cent of the total output of shops 1 and 2 for the period. For the same period, the output of shop No. 2 was 52.78 per cent of the total output of the two shops. For the period from December, 1910, to January, 1913, inclusive, which was the lock-gate period, the output of shop 1 was 46.2 per cent of the total output of shops 1 and 2. The output of shop No. 2 for the same period was 53.8 per cent of the total output of shops 1 and 2. For the period from February, 1913, to January, 1914, inclusive, the output of shop No. 1 was 46.24 per cent of the total output of both shops, and the output of shop No. 2 was 53.76 per cent of the total output of the two shops.

From this it will be seen that the output of shop No. 1 was reduced in substantially the same proportion during the lock-gate period as the output of shop No. 2. Stated in tons, the output of shop No. 1 for the lock-gate period was 2,246 tons per month. During the year immediately preceding the lock-gate period it was 3,312 tons, and during the year immediately succeeding the lock-gate period it was 2,833 tons per month.

A reduction in the shop output of shop No. 1 for the period of the lock-gate construction would increase the general expenses per ton of the output of shop No. 2 for the period during which the output in shop No. 1 was reduced. As shown above, the output of shop No. 1 during the period of fabrication of lock-gate material decreased in about the same proportion as the output of shop No. 2.

If the output of shop No. 1 had been equal to the average output of this shop during the period from December, 1909, to November, 1910, and from February, 1913, to January, 1914, inclusive, the total output of the two shops for the period of the lock-gate construction would have been increased by 21,466 tons, and the total output



of shops Nos. 1 and 2 for the lock-gate period would have been 126,351 tons, plus 21,466 tons, or 147,817 tons. (For data see vol. 27 of evidence.)

This increase in general expenses due to loss of output in shop No. 1 is found as follows:

The total tonnage for shop 1 for the lock-gate period was 58,406. This divided by 26 would give 2,246 tons as the monthly output. The tonnage of shop 1 for the 12 months immediately preceding and the 12 months immediately succeeding the lock-gate period was 73,725. This is equal to an average monthly tonnage of 3,072. This multiplied by 26, the number of months in the lock-gate period, would give a tonnage of 79,872 for shop 1, if the average had been maintained during the lock-gate period. The general expenses per ton during the lock-gate period in shop 1 was \$7.62. At this rate, if we compare with a tonnage of 79,872, or for 26 months, the total general expenses for shop 1 for the lock-gate period would have been \$608,624.64. At \$6.35 per ton (79,872 tons) the total general expense would have been \$507,187.20. This shows a total increase in general expenses due to loss of output in shop No. 1 of \$101,437.44. The total assumed tonnage on which this is based is 126,351, plus the difference between 58,406 tons, the actual tonnage of shop 1, and 79,872 tons, the assumed tonnage, making 147,817 tons on which the increase is based. One hundred and one thousand four hundred and thirty-seven dollars and forty-four cents divided by 147,817 gives 69 cents as the increase per ton in general expenses due to loss of output in shop 1.

There were breakdowns in the power house that affected the output of shop No. 2. In a letter of August 16, 1912, found in General Exhibit No. 4, index number of letter 287, the McClintic-Marshall Construction Co. claims a delay of 72 hours, or 7 days, and request an extension of time on this account for breakdowns in the power house.

In a letter of September 6, 1912, same reference number as above, the details of the way in which these breakdowns affected the work are given. In the last paragraph of this letter of September 6, 1912, the statement is made that "These breakdowns entailed a delay in several departments of the shop, which when averaged make an aggregate of seven days' lost time between July 9 and August 15, 1912.

In a letter of September 26, 1912, Exhibit No. 8, in the testimony of Mr. McClintic, found in General Exhibit No. 19, volume 19, Mr. McClintic stated:

As you know, we have been terribly handicapped on account of breakdowns in our power house for the last two months, which largely accounts for this small tonnage.

This letter was written in reply to a letter from Mr. Hammer complaining of the small amount of lock-gate material that was turned out during the month of August.

In the claim, page 72, the output of material in shop 2 for May, 1912, is given as 3,003 tons, the output for June as 2,601 tons, the output for July as 2,679 tons, the output for August as 2,716 tons, the output for September as 2,488 tons, the output for October as 3,047 tons. It is a fact, therefore, that the output of shop No. 2 was considerably decreased owing to the breakdowns in the power house.



If we take the month of May, 1912, and the month of October, 1912, as indicating the average output of shop No. 2 under the conditions as they existed at that time, it would amount to 3,025 tons per month. The average output for the four months between October and May was 2,618 tons, showing a loss in output for these four months of 1,628 tons. The major part of this loss in output was undoubtedly due to the breakdowns in the power house of the McClintic-Marshall Construction Co. At the very lowest 1,200 tons of the reduced output should be charged to the breakdowns in the power house of the McClintic-Marshall Construction Co.

This reduction in the output of shop No. 2 of 1,200 tons, due to breakdowns in power house, increased the shop cost and general expenses in shop No. 2 by 30 cents a ton for the period during which the material was being fabricated.

The increased shop cost and general expenses of shop No. 2 of 30 cents a ton, due to breakdowns in power house, are ascertained in the following way:

The total departmental shop cost and general expenses of shop No. 2 for the lock-gate period was \$1,199,296.06. This divided by 67.945, the tonnage of shop 2, would show that the departmental shop cost and general expenses were \$17.65 per ton. One thousand two hundred tons added to this would give 69,145 tons as the total output if there had been no breakdowns in the power house. The total cost as shown, divided by this, would give a cost per ton of \$17.35. The difference between \$17.35 and \$17.65 represents the increase in cost of fabricating the material in shop 2 due to the breakdowns in the power house, or 30 cents per ton.

During the period that the lock-gate material was going through shop No. 2 the rising stem and lateral culvert valve material, W. O. 28323, was going through shop No. 2.

On September 10, 1912, Mr. Pittman, for the McClintic-Marshall Construction Co., called attention to the fact that considerable delay was being caused by the rejection of material on this contract. This undoubtedly affected the output of shop No. 2 to some extent, but it is not possible from the records to determine the amount of reduction in output that was due to rejections under this contract.

That the charge made above to cover the increased cost due to breakdowns in power house is justified is shown by the increase in the charge for repairs, fuel and water, and equipment adjustments, which appear in the summary of the general expenses of the Rankin plant for the months of August, September, and October, 1912. (See General Exhibit No. 27, vol. 27, data compiled at Rankin, Pa., Apr. 11, 1915, to May, 1915, under direction of B. F. Harrah, member of committee.)

The night force was taken off in September, 1911, and the output of shop No. 2 voluntarily reduced. (See Price's testimony, General Exhibit No. 10, vol. 10, p. 52.)

The rivet and bolt pay roll for the months of October, November, and December, 1911, and for the months of January, February, and March, 1912, Rankin shops 1 and 2, were the lowest for any months during the fabrication of lock-gate material, with the single ex-



ception of the month of February, 1911. The percentage of general expenses were higher during this period than they were for any other time during the fabrication of the lock-gate material. The total expenses, however, were somewhat reduced during this period, in fact the reduction in the total expenses was greater than the reduction in the total output, so that apparently the average cost of fabricating the material in shops Nos. 1 and 2 was lower during this period than it was during the other periods of fabrication of the lock-gate material. This fact is stated for the purpose of showing that the output in shop No. 2 for this period was voluntarily reduced by the Contractor. It also tends to show that the manufacturing cost was greater during the period when the night force was on than when such force was not in use.

The record shows that the output of shops Nos. 1 and 2 was greater for the four months immediately preceding October, 1911. For September, 1911, the general expenses had been reduced to 93.3 per cent of the departmental shop cost in shops 1 and 2. The total average expense for fabricating material for shops 1 and 2 for this month was apparently \$13.09. In shop No. 2 the work was proceeding with less interruptions and less excessive cost than at practically any other period of the fabrication of that material.

The facts above stated with relation to the output of shops Nos. 1 and 2, showing causes for the reduced output, are pertinent to this investigation as tending to show that the reduced output of shop No. 2 was due, in part at least, to other causes than the severity of the inspection and the requirements made by the Isthmian Canal Commission upon the Contractor.

As above shown, the actual cost of fabricating the lock-gate material in shop 2 was \$17.89 a ton, on the basis of a general expense of 1.036 per cent of shop labor cost. This cost per ton, however, should be reduced by 99 cents a ton to take care of the increased general expenses in shop 1 for the lock-gate period, and by reason of the reduced output of shop 2 due to breakdowns in power house. The cost per ton with which the lock-gate material should be compared with all other material fabricated in shop 2, or in shops 1 and 2, or for any period in shop 2, is therefore \$16.90 per ton.

On this basis, the average cost of fabricating the lock-gate material was \$4.87 a ton in excess of the average cost of fabricating material in shop No. 2 for the period from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, so far as such average cost can be arrived at from the records of the McClintic-Marshall Construction Co.

Compared with all other material passing through shops 1 and 2 for the period from December, 1909, to January, 1914, inclusive, the excess cost of fabricating the lock-gate material was \$3.45 per ton.

The claimant's contention, as stated on pages 68 and 69 of the claim, that the lock-gate material cost \$4 per ton more to fabricate than all other material passing through shop No. 2 for the periods from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, is established.



The question as to whether or not the evidence shows that it should have cost more or less under normal and reasonable inspection than all other material passing through shop No. 2 for the periods from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, is yet to be considered, as well as the question as to what part, if any, of the excess cost above what it should have been, if any should be found, was due to the Contractor being required to do the work "under requirements as to character and finish not fairly within the meaning of the specifications."

Further consideration of claim No. 2 will be made on the basis of the evidence establishing the fact that it cost \$12.03 a ton to fabricate all material passing through shop No. 2 for the periods from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, and that it cost \$13.45 per ton to fabricate all material passing through shops Nos. 1 and 2, other than lock-gate material, for the period from December, 1909, to January, 1914, inclusive, and that it cost \$16.90 a ton to fabricate the lock-gate material, exclusive of the cost due to causes which ought not to enter into the comparison between the cost of the lock-gate material and other material passing through shop 2 or shops 1 and 2, for the reason that such excess cost, as above shown, was due wholly to causes for which the Contractor is unquestionably responsible.

After the contract was let on the basis of the original specifications, Mr. Henry Goldmark, the designing engineer, in going over plans and drawings with Mr. Paul Wolfel, the chief engineer of the Contractor, made radical changes. These changes are set forth in detail in the last pages of the claim. They were effected by a contract signed on August 8, 1910, referred to in the testimony as the agreement of August 8, 1910, copy of which is attached hereto. The changes as provided for in this agreement and other changes in detail and design authorized under the direction of Mr. Henry Goldmark increased the manufacturing, shop labor, and general expenses by \$118,647.29 and reduced it by \$21,308, effecting a net change of \$97,339.29 in the shop cost of this material. (For an explanation of this increase in the shop cost, see the statement prepared by Mr. Pendergrass of the McClintic-Marshall Construction Co., April 30, 1915, found in General Exhibit No. 27, vol. 27. A copy of this statement is attached hereto for ready reference—see Appendix B.)

The principal consideration for the changes made by the agreement of August 8, 1910, was the provision relative to the end planing contained in paragraph 16 of the agreement of August 8, 1910. This paragraph reads as follows:

Permission is granted of making the end reaction castings one story in height only. This is done for the reason that the McClintic-Marshall Construction Co. expects to demonstrate during the assembling of some of the gates in their yard that the work can be done so near correct that any minor adjustment can be made by means of babbitting between the end reaction castings and the nickel steel bearing plates and the planing of the end plates done at the shop instead of in the field.

See testimony of Mr. Wolfel, General Exhibit No. 7, volume No. 7, page 71, fourth paragraph, also pages 106 to 151, with special reference to pages 141 to 143, inclusive.



See testimony of Mr. Pendergrass, General Exhibit No. 15, volume 15, pages 18 to 28, 100, 111, and 112.

See testimony of Mr. Goldmark, General Exhibit No. 8, volume No. 8, pages 18 to 21, 172 to 178, and 212. See also Mr. Goldmark's letter to Mr. Hammer, dated August 8, 1910, paragraph 8 (see p. 199 of Mr. Goldmark's report, marked "General Exhibit No. 1," vol. 1). In this letter the modifications made in the agreement of August 8, 1910, are referred to by Mr. Goldmark as follows:

During the past week I have conferred with Mr. P. L. Wolfel, chief engineer of the McClintic-Marshall Construction Co., and have agreed upon a number of small modifications in the plans and specifications and certain different details not provided for in our plans, all of which are contained in blue-print memorandum attached to this letter, and are to be considered binding.

See letter of August 18, 1910, from Capt. Boggs to the chief quartermaster, also letter from the acting chief quartermaster, prepared by Mr. Goldmark, dated September 2, 1910. These letters are found in the report of Mr. Goldmark above referred to, pages 156 to 157. The letter prepared by Mr. Goldmark is intended as an explanation of the changes to be effected in the agreement of August 8, 1910.

See also, in connection with the change in the weight, Mr. Goldmark's testimony, General Exhibit No. 8, volume 8, pages 23 to 25 and pages 246 to 247.

Whatever may have been the consideration for these changes, however, the important fact at this point is that the shop cost was increased by the amount shown. This increase in the shop cost was not due to the character of the inspection, except in so far as the cost may have been augmented by the inspectors requiring more and better work for this extra work than was called for in the agreement of August 8, 1910.

The departmental shop cost and general expenses for fabricating the lock-gate material as above found is based on a total tonnage of 53,943 tons; \$97,339.29 divided by 53,943 shows that the McClintic-Marshall Construction Co. expended \$1.80 per ton to effect these changes. If it is assumed that the lock-gate material was as difficult to manufacture under the original specifications as other material passing through shop No. 2 for the periods from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, it would have cost \$12.03 a ton under the original specifications. If we divide \$97,339.29 by \$12.03, it would show that the extra cost added by the agreement of August 8, 1910, was equivalent to an added tonnage under the original specifications of 8,091. On the basis of 53,943 tons, at \$12.03 per ton, it would have cost to fabricate the lock-gate material \$648,934.29; \$97,339.29 added to this would make the total cost \$746,273.58. This divided by 53,943 tons would give \$13.84 as the shop cost of manufacturing the lock-gate material under the original specifications when increased by the extra work placed in the shop under the agreement of August 8, 1910, on the assumption that the lock-gate material was as difficult to manufacture under the original specifications as other material passing through shop No. 2 for the period from December, 1909, to November, 1910, and from February, 1913, to January, 1914, inclusive.

The evidence shows that special tools and equipment to the value of \$52,488.94 were purchased for use of the shop in the manufacture of the material for the lock gates. This charge represents only the proportion of the cost of these tools and equipment charged to the lock-gate contract. (See par. 6 of letter from Mr. W. M. Sterrett, manager McClintic-Marshall Construction Co., dated Apr. 1, 1915, General Exhibit 26, vol. 26.) This expense seems to be an expense that it became necessary for the McClintic-Marshall Construction Co. to make by reason of the character of the lock-gate material. That this is so is shown by an analysis of the charges for repairs and general expenses in the summary of general expenses furnished by the McClintic-Marshall Construction Co. (See General Exhibit No. 27.)

The total repairs for shops 1 and 2 for the period from December, 1910, to January, 1913, inclusive, was \$259,340.16. This divided by the total tonnage of these shops, 126,351 tons, would show the average expenditure for repairs in shops 1 and 2 during the lock-gate period to be \$2.05 per ton. The total amount expended for repairs for the year immediately preceding and the year immediately succeeding the lock-gate period for shops 1 and 2 was \$223,154.96. This divided by 156,561, the total tonnage for these two shops for the periods stated, would show an expenditure for repairs for shops 1 and 2 of \$1.42 per ton. If \$1.42 a ton should be taken as the normal expenditure for repairs in shops 1 and 2 during the lock-gate period (though probably with the decreased output the unit cost of repairs would be appreciably higher), it would show an expenditure for repairs equal to 126,351 by \$1.42, or a total of \$179,418.42. This deducted from the actual expenditure, \$259,340.16, would indicate an excess expenditure for repairs in shops 1 and 2 for the period of the fabrication of the lock-gate material of \$79,921.74.

The conclusion, therefore, that the \$52,488.94 represents an expenditure peculiar to the lock gates is justified. The cost of the lock-gate material would necessarily be increased by the amount of this expenditure independently of any requirements made by the Panama Canal, and if it was an expenditure which was required to be made on account of the peculiar character of the lock-gate material it should be charged as an extra expense for manufacturing the lock-gate material by reason of the inherent character of the material. The average cost per ton for this equipment was 97 cents. This sum, on the assumption that the equipment was required because of the character of the lock-gate material as distinguished from the character of other material with which it is compared, should be added to the cost per ton for fabricating the lock-gate material.

The evidence establishes the fact that it was necessary for the contractor to purchase this equipment and these repairs to properly equip his shop for the manufacture of the lock-gate material under the original specifications.

The special equipment purchased at the beginning of the contract and the credits allowed at the end of the contract are shown in the list given below:



Panama shop equipment.

		Cost.	Disposition.
Equipment	62 1 No. 9 Williams White bulldozer.....	\$9,975.20	Equipment \$2,250.
	63 1 36-foot plate planer.....	7,304.21	Equipment.
	64 1 duplex milling machine.....	10,485.11	Equipment \$3,000.
	66 Sand-blast machines.....	3,724.83	Equipment \$500.
	70 Furnace for heating corner plate for Panama.....	881.16	Equipment \$600.
	71 Triple bolt cutter with milling head.....	1,333.03	Do.
	73 Dust arrester, sand elevator and separator.....	2,208.52	
	74 1 2-inch bolt pointer with bushings and cutters for Panama work.	284.05	Equipment.
	75 1 air grinder for Panama work.....	159.50	
	76 Electric welding layout.....	174.47	
	77 2 magnetic gogs for beam punches.....	268.24	
	78 8 air jacks for new and old planer.....	348.30	Equipment \$140.
	79 1 single tree, tons, Panama.....	77.94	
	80 2-inch triple bolt cutter with milling attachment...	1,442.50	Equipment \$600.
	81 1 20-foot Niles planer.....	3,121.10	Equipment \$900.
	82 3 48-inch rotary planers, Panama.....	8,227.20	Equipment \$4,000.
	86 Additional sand-blast machine, fan motor, Panama.	753.36	
	87 36-inch Pond planer, Panama.....	3,732.43	Equipment.
	88 8-foot Hilles-Jones bending roll, Panama.....	3,030.33	Equipment \$1,350.
	89 1-foot light balance beam, Panama.....	74.48	
Improvement	58 Shear attachment for No. 6 lattice punch.....	1,265.27	
	59 Blacksmith shop in stock shed.....	1,996.07	
	60 Punch die for manhole, Panama.....	115.79	Equipment.
	61 Remodeling beam crane over new bulldozer.....	180.27	
	62 Changing spacing table, No. 2 shop.....	1,294.00	
	64 Coping attachment for shear, No. 2 shop, Panama.	207.09	
	65 2 cast-iron dies for bulldozer, Panama.....	1,130.49	
Special	67 Rocks for painting plate, No. 2 yard.....	91.19	
	19 Castings for facing ends of girders, Panama.....	1,269.43	\$65,155.64.
CHARGE.			
4845	Shop equipment.....	40,379.16	
	Equipment.....	24,776.48	
		65,155.64	

Special No. 22.

Bushings .....	\$923.16
Bulldozer dies.....	590.06
Checking holes.....	1,705.18
Clamp for duplex milling.....	42.53
Gauge for water-tight frame.....	100.55
Head for facing nut.....	307.03
Templet .....	1,932.89
Jigs .....	950.45
Moving reamers.....	293.56
Packing for reamers.....	222.82
Jib crane .....	52.31
Scaffold for assembling gates.....	91.56
Gauge for rivet dies.....	44.07
Skids in yards.....	1,343.93
Table for plate-milling machine.....	278.63
Dies, water-tight frame.....	833.15
Clamp for fitting girder.....	220.00
Office furniture.....	221.65
Electric welding.....	238.95
Expense getting men .....	625.75
Miscellaneous rivet tests, tapes, etc.....	253.22
Portable house .....	80.68
11,352.13	

Charge 4845, shop equipment.

The above statements relative to shop equipment for fabricating material under item 1 at Rankin shops were obtained from the examination of the books of the McClintic-Marshall Construction Co.

April 21, 1915, and appears in General Exhibit 27, volume 27 of the evidence. Mr. Patterson, the auditor of the McClintic-Marshall Construction Co., stated that the amounts shown as "Cost" represent the amounts paid for the various items which were purchased at the time the contract was begun. The column headed "Disposition" represents the value of this equipment at the close of the contract according to the estimate of the Contractor. The original cost of the machinery was verified from the vouchers covering the payments for these items as shown on the books.

The testimony of Mr. C. M. Neeld, who was the manager of the McClintic-Marshall Construction Co.'s shops from the time the work started until June 1, 1911, General Exhibit No. 23, volume 23 of the testimony, pages 6 and 7, shows that he suggested that many of the tools and equipments be purchased to properly equip the shops. Among the particular tools are the following:

A tool for planing the ends of the girders to overcome the planing in the field.

Two vertical milling machines.

One bulldozer.

All of the above were considered as extra shop equipment.

On page 7 he also refers to steel templets and the largely increased blacksmith facilities that it was necessary to adopt to make the water-tight frames, also incidental punches, special large punches, special foundations for assembling the gates, and sandblast and pickling plant.

From an examination of the departmental shop cost of the McClintic-Marshall Construction Co. it appears that the sandblast and pickling plant might be considered as special equipment peculiar to the lock gates, also the special large punches for the punching of circles and punching holes in the manhole frames for the gates.

On items 3 to 9, inclusive, of the contract and on items 10A, 10B, 15, 16, 17, and 18 castings were purchased as follows:

	Pounds.
Item 3-----	1, 201, 130
Item 4-----	770, 932
Item 5-----	8, 206, 758
Item 6-----	192, 950
Item 7-----	302, 190
Item 8-----	28, 770
Item 9-----	259, 986
Item 10A -----	348, 537
Item 10B -----	20, 132
Item 15-----	23, 541
Item 16-----	813, 697
Item 17-----	149, 156
Item 18-----	11, 126
Total castings -----	12, 328,905

On item 11 babbitt metal was purchased to the amount of 778,297 pounds.

None of this material, amounting to 6,553 tons, has been carried into the tonnage as output of shops Nos. 1 or 2. Administrative expenditures, however, in connection with this material were incurred to the amount of \$14,658.56. This divided by 53,943 tons would show an administrative expenditure in connection with this material of 27



cents per ton when applied to the tonnage of the lock-gate material passing through shop No. 2.

It will be noted that about 10 per cent of all the lock-gate material was castings. The administrative expenses in connection with this material, owing to the great amount of it compared with the material that went through the shops and on which the tonnage price for fabricating is based, it seems should be considered as an expense peculiar to the lock-gate material. The 27 cents should, therefore, be added to the price of fabricating the lock-gate material as an expenditure peculiar to the conditions under which the material was fabricated, and not ordinary and usual in connection with the fabrication of other material with which it is compared.

Another special feature that would affect the cost of fabricating the lock-gate material was the requirement that one complete leaf of each different height included in the contract should be assembled and bolted together, and each piece in the leaves match marked to facilitate reassembly. The details of this operation are shown in paragraph 120 of the specifications, which provides as follows:

In order to detect any errors in the templets, etc., the Contractor shall erect at his works, without charge, one complete leaf of each different height included in his contract. Such leaves shall be carefully assembled and bolted together, but are not to be riveted up nor have the rivet and bolt holes reamed. Each piece in these leaves shall be match marked, so as to facilitate reassembling. All other leaves of the same height shall be built from the same templets but need not be erected in the shops. Any errors in the templets or elsewhere found during the shop erection must be corrected in all leaves.

The expenses incurred in complying with this provision of the specifications were not kept separately, but were included as a part of the expenses applied to the different operations, as shown in detail in the analysis of the departmental shop cost made by the McClintic-Marshall Construction Co., as shown in General Exhibit No. 26. It has been estimated, however, that it would cost to assemble one leaf, complete, \$1,200.

The assembly of the 82-foot leaf, the 66-foot leaf, and the 77-foot 10-inch leaf, in so far as the latter leaf was a duplicate of the 77-foot leaf, was waived. It does not appear, therefore, that more than four leaves were completely assembled in the yards of the Contractor.

There were seven different heights of leaves, and if one leaf of each height had been assembled, as provided for under the original specifications, the cost for complying with this requirement would have been \$8,400, or 15 cents per ton. This work, however, was provided for under the original specifications, and no separate and distinct charge will, therefore, be made at this time to cover this expenditure as peculiar to the lock-gate material, but it will be taken into consideration in comparing the difficulties of manufacturing the lock-gate material with other material passing through shop 2 for the periods from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive.

On the assumption that, under the original specifications, the lock-gate material was as difficult to manufacture as other material passing through shop 2 for the period with which it was compared, and adding the tonnage price of the extra work, the tonnage price of equipment and tools peculiar to the lock gates, and the tonnage price

of the general expenses in connection with the purchase of the large amount of castings for the lock gates, we would have the following results as to the cost of fabricating the lock-gate material, independently of any unreasonable requirements made by the Isthmian Canal Commission:

	Per ton.
Cost under original specifications, assuming it is as difficult to manufacture as other material passing through shop 2 for the period from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive-----	\$12.03
Extra work and expenses added by the agreement of Aug. 8, 1910, and other changes-----	1.80
Expenditures for equipment and tools due to the inherent character of the lock-gate material-----	.97
General expenses in connection with the purchase of a large amount of castings not ordinarily required in structural steelwork-----	.27
Total-----	15.07

The actual price of fabricating the lock-gate material, if the average conditions had existed in shop 1 during the lock-gate period, and if there had been no breakdowns in the power house of shop 2 during the lock-gate period, on a general expense of 1.036 per cent of shop labor, has been established at \$16.90 a ton. The difference between \$16.90 and \$15.07 per ton is \$1.83. This difference, under any view of the case, may be fairly considered as excess cost due to any or all of the following causes:

First. The inherent character of the lock-gate material and the difficulties of manufacturing it.

Second. Any excessive demands, unreasonable requirements and delays, and interruptions in the manufacture on the part of the Isthmian Canal Commission.

Third. Any lack of experience on the part of the Contractor with water-tight work and special character of work required in fabricating the lock gates.

These causes, as they may have affected the price, will now be considered.

The Contractor claims that the lock-gate material should have been fabricated, as it was finally turned out of the shops at an average cost of \$2 a ton less than the average cost of all the work turned out of shop 2 for the year preceding and the year succeeding the lock-gate period, for the reason that there was so much duplication in the work and such a large proportion of the work simply punched and drilled without being assembled or riveted. He claims that the entire increase in cost of fabrication was due to delay in furnishing the Contractor the necessary data, unfair demands of the Commission's engineers, and unreasonable shop inspection. (See p. 68 of the claim.)

The contention of the Contractor that the work should have been manufactured for \$2 per ton less than all other work turned out of shop 2 for the year preceding and the year succeeding the fabrication of the lock-gate material will be first considered.

The total number of members required for the lock gates on the 92 leaves, and whether such members were drilled or punched, is shown in the following table:



[W. O. 23444.]

Total number of members required for lock gates, 92 leaves.

[Contractor's order Nos. 4845, 4847, 4849, 4851, 4853, 4853, 4857, 4857½, 4859, 4861, 4863, 4865, 4867.]

Members.	Mark.	Total number.	Shop riveted.
Girders.....	G	1,540	Riveted.
Diaphragms.....	A	2,804	Do.
Do.....	B	2,804	Do.
Diaphragms, water-tight.....	WF	2,544	Do.
Diaphragms, nonwater-tight.....	CF	4,696	Do.
Doubling plates.....	DP	1,848	Punched and drilled.
Bent plates.....	BP	1,960	Riveted.
Sheathing plates, upstream.....	U	4,344	Punched and drilled.
Sheathing plates, downstream.....	D	3,080	Do.
Cover plates.....	C	3,432	Do.
Diaphragms, water-tight.....	WB	92	Riveted.
Intercostals.....	K	61,000	Do.
Wedges.....	W	5,424	Punched and drilled.
Splice plates.....	SP	7,736	Do.
Do.....	S	8,872	Do.
Fillers.....	F	31,604	Do.
Do.....	FN	504	Do.
Miscellaneous loose pieces.....	M	4,048	Do.
Footwalk frames, etc.....	FW	8,664	Riveted.
Ladders.....	L	2,348	Do.
Upper jaw.....	J-1	92	Do.
Jaw supports.....	J-2-3-4	276	Do.
		159,712	

The following table gives the same information as to the members required for spare parts:

[W. O. 23444.]

Total number of members required for spare parts

[Contractor's order No. 4873.]

Members.	Mark.	Total number.	Shop riveted.
Girders.....	G	42	Riveted.
Diaphragms.....	A	110	Do.
Do.....	B	110	Do.
Diaphragms, water-tight.....	WF	96	Do.
Diaphragms, nonwater-tight.....	CF	168	Do.
Doubling plates.....	DP	154	Punched or drilled.
Bent plates.....	BP	172	Riveted.
Sheathing plate, upstream.....	U	282	Punched or drilled.
Sheathing plate, downstream.....	D	192	Do.
Cover plates.....	C	136	Do.
Diaphragms, water-tight.....	WB	2	Riveted.
Intercostals.....	K	2,170	Do.
Wedges.....	W	282	Punched or drilled.
Splice plates.....	SP	274	Do.
Do.....	S	354	Do.
Fillers.....	F	1,278	Punched.
Do.....	FN	28	Do.
Miscellaneous loose pieces.....	M	101	Punched or drilled.
Footwalk frames, etc.....	FW	168	Riveted.
Ladders.....	L	74	Do.
Upper jaw.....	J-1	2	Do.
Jaw supports.....	J-2-3-4	6	Do.
		6,101	

This table is a concrete illustration as to the amount of duplication in the work. It also gives pretty much in detail the character of the material, as to whether it is riveted, punched and drilled, or merely punched.

In the testimony of Mr. Henry Goldmark, general exhibit No. 8, volume No. 8, exhibit No. 4 of this testimony, there is a classification of weights on one 77-foot leaf, item 1, giving the description of the member, the weight, percentage of total, percentage punched, percentage drilled, and percentage riveted. This table was prepared by Mr. Wolfel, and, for easy reference, is quoted below :

Classification of weights for one 77-foot leaf, item No. 1.

Description.	Weight.	Per cent.	Per cent punched.	Per cent drilled.	Per cent riveted.
Girders.....	455,459	37.50	37.50	0	37.50
Diaphragms A.....	76,528	6.29	3.07	3.22	6.29
Diaphragms B.....	19,010	1.56	1.56	0	1.56
Nonwater-tight frames.....	54,596	4.51	4.51	0	4.51
Water-tight frames.....	40,817	3.35	3.18	.17	3.35
Intercostals.....	69,246	5.83	5.83	0	5.83
Bent plates.....	26,118	2.14	2.14	0	1.48
Sheathing plates.....	255,537	21.04	12.04	9.00	0
Cover plates.....	65,468	5.38	5.38	0	0
Doubling plates.....	30,498	2.50	2.50	0	0
Splice plates.....	19,361	1.60	1.60	0	0
Wedges.....	7,842	.64	.64	0	0
Rivets.....	58,546	4.81	0	0	0
Fillers.....	9,128	.75	.75	0	0
Miscellaneous.....	25,549	2.10	2.10	0	0
Total.....	1,214,003	100.00	82.80	12.39	60.52

Per cent.		Per cent.	
Punched work.....	82.80	Riveted work.....	60.52
Drilled work.....	12.39	Not riveted.....	34.67
Field rivets.....	4.81	Field rivets.....	4.81
100.00		100.00	

The percentages given are approximately correct, but the entire amount of the bent plates should be classed as riveted material, making a change in the totals of the percentage riveted and the percentage not riveted. This change made in the percentage of riveted work gives 61.18 per cent as riveted work.

Applying the above percentages to a tonnage of 53,943, which is heretofore shown as the amount of material on which the departmental shop cost and general expenses are based, the weights of the different classes of material are as follows:

	Tons.
Girders .....	20,228
Diaphragms A.....	3,393
Diaphragms B.....	842
Nonwater-tight frames.....	2,433
Water-tights.....	1,807
Intercostals .....	3,146
Bent plates.....	1,154
Sheathing plates.....	11,350
Cover plates.....	2,902
Doubling plates.....	1,349
Splice plates.....	863
Wedges .....	345
Rivets .....	2,595
Fillers.....	405
Miscellaneous .....	1,133

On October 4, 1915, the claimant made an estimate of the departmental shop cost of a 77-foot leaf, classified in accordance with the different kinds of material. This estimated cost is given below :



*Cost estimate of 77-foot leaf of class of work.*

Classification.	Per cent. of total.	Esti- mated unit manu- facturing cost.	Product.
Girders.....	37.50	\$0.33	\$12.37
Diaphragm A.....	6.29	.50	3.14
Diaphragm B.....	1.56	.40	.62
Nonwater-tight frames.....	4.51	.30	1.35
Water-tight frames.....	3.35	.70	2.35
Intercostals.....	5.83	.30	1.75
Bent plates.....	2.14	.40	.86
Sheathing plates.....	21.04	.10	2.10
Cover plates.....	5.38	.15	.81
Doubling plates.....	2.50	.20	.50
Splice plates.....	1.60	.15	.24
Wedges.....	.64	1.00	.64
Rivets.....	4.81	.08	.38
Fillers.....	.75	.20	.15
Miscellaneous.....	2.10	.25	.53
Total.....	100.00	.278	27.79

Average cost, 0.278 cents, or \$5.56 a ton.

On the basis of this estimate of the departmental shop cost, increased by 91.3 per cent to cover a general expense equal to the general expense for the period from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, the various members of the lock-gate material would have cost to fabricate the amounts shown in the table below (see p. 47) :

Members.	Total weight.	Cost per ton on estimate.	Total.
	<i>Tons.</i>		
Girders.....	20,227	\$12.63	\$255,467.01
Diaphragm A.....	3,393	19.13	64,908.09
Diaphragm B.....	842	15.30	12,882.60
Nonwater-tight frames.....	2,433	11.47	27,906.51
Water-tight frames.....	1,807	26.88	48,572.16
Intercostals.....	3,146	11.47	36,084.62
Bent plates.....	1,154	15.30	17,656.20
Sheathing plates.....	11,350	3.83	43,470.50
Cover plates.....	2,902	5.74	16,657.48
Doubling plates.....	1,348	7.65	10,312.20
Splice plates.....	863	5.74	4,953.62
Wedges.....	345	38.26	13,199.60
Rivets.....	2,595	3.06	7,940.70
Fillers.....	405	7.65	3,098.25
Miscellaneous.....	1,133	9.57	10,842.81
Total.....	53,943	.....	573,952.35

The above estimate is considerably in excess of the original estimate of the McClintic-Marshall Construction Co. upon which their bid was made. This original estimate is attached and made a part of the testimony of Mr. C. D. Marshall, General Exhibit No. 11, volume No. 11. The total finished weight of the material paid for under item 1 for the original 92 gates and spare parts was 106,963,929 pounds, or 53,482 tons, approximately. Upon this basis the manufacture of item 1 of the gates and spare parts, including the sand blast and pickling, would have cost, under Mr. Marshall's estimate, \$288,802. The general expenses under Mr. Marshall's estimate

amounted to \$224,424. The expense of manufacturing this item of gates and spare parts, including sand blast and pickling, according to the statement made up by the Contractor, amounted to \$486,161; and the general expenses, including administrative expense, \$420,546; making the total departmental shop cost and general expenses \$906,707.

The difference between the amount of the departmental shop cost and the general expenses, as shown by this statement and as heretofore found, is due to the fact that in making up this statement the \$52,488.44 for miscellaneous shop equipment was not included; neither are certain administrative expenses included in this statement which have been included in the findings heretofore made. The purpose of referring to this statement at the present time is to show how widely different is the actual expense of manufacturing this material from the estimate as made by the McClintic-Marshall Construction Co. The facts do show, as claimed by the Contractor, that there was much duplication in the work, and that a considerable proportion of the work was simply punched and drilled without being assembled or riveted.

There are, however, other elements that enter into the cost of this work probably to a greater extent than the work with which it is compared that should be taken into consideration. A detailed comparison of the shop cost of this work with the shop cost of other work passing through shop 2 for the periods named is shown in the following table, made up from the records of the departmental shop cost furnished by the claimant. (See General Exhibit No. 26, vol. No. 26.)

No.		Departmental shop cost of all material passing through shop 2, 1909 to 1910, inclusive, and 1913 to 1914, inclusive, combined.	Departmental shop cost of lock-gate material passing through shop 2, December, 1909, to January, 1913, inclusive.	Excess for all material passing through shop 2, 1909 to 1910, inclusive, and 1913 to 1914, inclusive.	Excess for lock-gate material passing through shop 2, December, 1910, to January, 1913, inclusive.
1	Making templates.....	\$0.2773	\$0.0927	\$0.1846	.....
2	Making patterns.....	.0115	.0009	.0106	.....
3	Unloading.....	.1191	.1275	.....	\$0.0084
4	Plate straightening.....	.0441	.0629	.....	.0188
5	Running in.....	.1187	.1021	.0166	.....
6	Stockyard (lock-gate welding and duplex milling) .	.0400	.0590	.....	.0190
7	Shearing.....	.2174	.2491	.....	.0317
8	Laying off.....	.3110	.4209	.....	.1099
9	Trucking in Department L. O. & P.....	.1241	.1462	.....	.0121
10	Punching.....	.6074	.9062	.....	.2988
11	Punching cont. washers.....	.....	.0027	.....	.0027
12	Drilling.....	.1038	.2020	.....	.0982
13	Milling (lock-gate pickling).....	.0010	.1171	.....	.1161
14	Edge planing.....	.0260	.2277	.....	.2017
15	Bending and straightening.....	.0341	.0580	.....	.0239
16	Fitting.....	1.1444	1.3177	.....	.1733
17	Trucking in F. & R. departments.....	.1177	.1540	.....	.0363
18	Making jigs.....	.0002	.0139	.....	.0137
19	Reaming.....	.2441	.1055	.1386	.....
20	Subpunched reaming.....	.3470	.9440	.....	.5970
21	Countersinking (lock-gate bulldozer).....	.....	.1185	.....	.1185
22	Machine riveting.....	.7180	.6111	.1069	.....
23	Hand riveting.....	.2614	.0292	.2322	.....
24	Cut-out and redrive rivets (lock-gate sand-blast).....	.....	.2410	.....	.2410
25	Rotary planing.....	.1096	.2704	.....	.1608



No.		Depart- mental shop cost of all material passing through shop 2, 1909 to 1910, inclusive, and 1913 to 1914, inclusive, combined.	Depart- mental shop cost of lock-gate material passing through shop 2, December, 1909, to January, 1913, inclusive.	Excess for all material passing through shop 2, 1909 to 1910, inclusive, and 1913 to 1914, inclusive.	Excess for lock-gate material passing through shop 2, December, 1910, to January, 1913, inclusive.
26	Boring.....	\$0.0141	\$0.0086	\$0.0055	.....
27	Calking and riveting ladders.....	.....	.0333	.....	\$0.0333
28	Grinding.....	.....	.0162	.....	.0162
29	Chipping.....	.0753	.2643	.....	.1890
30	Blacksmith shop.....	.1607	.7689	.....	.6082
31	Machine shop.....	.1537	.2002	.....	.0465
32	Running out.....	.1176	.1948	.....	.0772
33	Storing.....	.0014	.0016	.....	.0002
34	Loading and bracing.....	.1270	.1580	.....	.1310
35	Indirect labor.....	.4328	.3565	.0763	.....
36	Painting.....	.1820	.2073	.....	.0253
	Add for pickling, bulldozer, and sand-blast, to cover small charges of this kind.....	6.2425 .0091	8.7900 .....	..... .....	..... .....
	Total.....	6.2516	.....	.....	.....

A complete detail of the departmental shop cost, showing a comparative analysis of shop cost from December, 1909, to February, 1914, inclusive, with totals, rates per ton, periods covered, and the lock-gate material segregated from other material passing through shop 2 for the period from December, 1910, to January, 1913, inclusive, as taken from the departmental shop-cost records of the McClintic-Marshall Construction Co., Exhibit No. 26, volume 26, is attached hereto for ready reference.

Referring to the tables on pages 45, 46, and 47, it appears that the total amount of riveted material given under the headings of girders, diaphragms A, diaphragms B, nonwater-tight frames, water-tight frames, intercostals, and bent plates, is 33,002 tons, and that the total cost of fabricating such material under the estimate of cost given on page 45 would be \$463,477.19, making the average cost per ton for fabricating such material \$14.043. It also appears that the material listed in the estimate as drilled or punched under the headings of sheathing plates, cover plates, doubling plates, wedges, rivets, fillers, and miscellaneous equals 20,641 tons, and that it cost to fabricate the same, at the unit cost arrived at, as shown on page 47, \$110,475.16. The total cost per ton for fabricating this material under the estimate would be \$5.35 per ton. The general average price of fabricating all of the material under the estimate would be \$10.64 per ton.

The total number of field rivets for the lock gates, as shown by the computation made by Mr. Hammer, completed under date of February 21, 1913 (see Exhibit No. 1 of the testimony of Mr. Thomas Conley, found in General Exhibit No. 22, vol. No. 22), is as follows:

	Rivets.
In skeleton.....	1, 169, 760
In upstream sheathing.....	2, 382, 680
In downstream sheathing.....	2, 021, 160
Reaction castings and wedges.....	153, 880
Total .....	5, 727, 480



In analyzing the estimate as to cost with a view to determining in what particulars it is inaccurate, it will be necessary to compare the estimated shopcost with the total shopcost of the various operations, against which the departmental shopcost is charged, as shown on page 49 of this brief and statement of facts.

The total departmental shopcost and general expenses under the estimate for the sheathing plates is \$3.83 per ton. The most important operations which must be performed on the sheathing plates in the shop are: Pickling, edge planing, laying off, punching, chamfering edges, preparing plates for shipment.

Some expense in connection with the sheathing plates would be incurred under each of the following operations mentioned in the departmental shopcost: Making templets, unloading, plate straightening, running it, shearing, laying off, trucking in department L. O. and P., punching, drilling, pickling, edge planing, fitting, trucking in F. and R. departments, running out, loading and bracing, indirect labor, painting.

As shown above (p. 50) there were 4,403,840 field rivets in the sheathing. This necessitated the punching of a very large number of holes, considerably over 400 to the ton in the material that was involved. The accuracy with which this was required to be done, in order that the holes might clean up probably when reamed out in the field, and in order that the work, when assembled, might fit up accurately in the field, necessarily tended to increase the cost of punching and the related operations much beyond the average.

It also appears that it was necessary, in order to comply with paragraph 21 of the agreement of August 8, 1910, to chamfer the edges of 2,472 sheathing plates at an estimated cost of \$1.60 apiece, or \$3,955. This would further increase the departmental shopcost of the sheathing plates. (See estimate of expenses in connection with the changes under the agreement of Aug. 8, 1910, made by Mr. R. A. Pendergrass, Apr. 30, 1915, and found in General Exhibit No. 27, vol. 27 of the evidence.)

It also appears that under paragraph 2 of the agreement of August 8, 1910, that the Contractor was compelled to incur an additional labor charge of almost \$3 a ton on 1,961 tons in order to ship the sheathing plates as required therein. This would also tend to increase the departmental shop cost of the sheathing plates.

The estimate of the departmental shop cost of the sheathing plates seems to be unreasonably low. This statement also applies, though in a less degree, to the cover plates.

In the estimate made by Mr. Pendergrass, as referred to on page 3 of this estimate, copy of which is attached to this report for ready reference, the average cost of shop work for fillers is fixed at 90 cents per hundredweight, or \$18 per ton, as against the estimated charge of \$7.65 a ton, as shown on page 47.

An examination of the books of the McClintic-Marshall Construction Co. discloses the fact that the charge placed against the contract for the manufacture of the rivets was 35 cents a hundred, or \$7 a ton. The departmental shop cost and general expenses for the rivets under the estimate was only \$3.06 a ton. It seems, therefore, that this estimated price is entirely too low.

The estimate as a whole seems to be too low and will be considered in detail hereinafter. (See table, beginning on p. 202 of this report.)



Mr. Goldmark states in his report, page 27, General Exhibit No. 1, vol. 1 (see also his testimony, p. 53, General Exhibit No. 8), that—

I agree with the Contractor that it would have seemed reasonable to expect shop costs no higher than on high-grade work for large bridges, especially as so large a proportion of the work was simply punched or drilled plates.

Mr. Goldmark was asked the question:

In view of your recent study of the lock-gate work and its comparison with bridge work and high-class structural work, do you think that that statement is accurate?

Mr. Goldmark answered:

Yes, sir; I think that statement is accurate.

Mr. Goldmark was asked:

You think, then, that the Contractor might reasonably base his calculations upon a shop cost for this work no higher than on high-grade work on large bridges?

Mr. Goldmark answered:

Well, I tried very hard to make it that way; and I think that these difficult special parts constituted a small proportion of this very big tonnage. I think the girders, many of the frames, intercostals, and especially those plates, after the shop plans were carefully worked out so that they had to go ahead and build them over and over again—I always looked for a low shop cost, and I should say not as high as in some of those great big bridges that have been built of late years.

Mr. Goldmark admits, however, that the sand blast and pickling were unusual requirements, also the assembly in the yard, but as to the assembly he does not think that that would be more expensive than like operations in bridge work.

If we compare the lock-gate material with the high-grade bridge work that was passed through shop 2 for the year immediately succeeding the fabrication of the lock-gate material, and give full credit to Mr. Goldmark as an expert and as being fully conversant with all features of its fabrication, and also give credit to his statement made after a careful study of the various features that might affect the shop cost of the lock-gate material as compared with other material, we would be bound to conclude that the lock-gate material should not have cost more than \$13.45 a ton to fabricate under normal conditions, and as compared with the fabrication of other material passing through shop 2 for the period of February, 1913, to January, 1914, inclusive. (See testimony of Mr. Goldmark, beginning on p. 45 and extending to p. 63, General Exhibit No. 8, vol. 8 of the testimony.)

Upon the same basis, with normal and usual conditions prevailing, the lock-gate material should not have cost more than \$12.03 a ton as compared with all material passing through shop 2 for the periods from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive.

The evidence does not show, however, that Mr. Goldmark carefully and accurately analyzed the probable shop cost of the lock-gate material as compared with the departmental-shop cost of high-grade bridge work; neither does it show that Mr. Goldmark at any time took into consideration fully the amount of the increase in shop cost that was made by the agreement of August 8, 1910, and subsequent agreements made by his authority through Mr. Hammer.



It is the opinion of your committee that, in view of all the evidence, the lock-gate material, under normal and ordinary conditions and usual and ordinary inspection under the original specifications, should have cost as much as the average cost of all material passing through shop No. 2 for the periods from December, 1909, to January, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, or \$12.03 a ton under the original specifications.

To this should be added \$1.80 a ton to cover the increased departmental-shop cost added to the original specifications by the agreement of August 8, 1910, and subsequent agreements made in the specifications, by Mr. Hammer under authority of Mr. Goldmark, in the manner in which the work was fabricated.

The expenditure for equipment and tools, due to the inherent character of the lock-gate material, appears to have been greatly in excess of any like expenditures for the manufacture of material passing through shop No. 2 for the year immediately preceding and the year immediately succeeding the fabrication of the lock-gate material. The amount of this excess expenditure for equipment and tools, due to the inherent character of the lock-gate material, as heretofore shown, was equal to 97 cents a ton. This should be added to the cost of fabricating the lock-gate material under the original specifications as an excess in the general expenses, due to the inherent character of the lock-gate material, not comparable with any like expenditure.

The general expenses incurred in connection with the purchase of a large amount of castings, are expenses that a contractor is not ordinarily required to incur in structural steel work, at least not to the extent that it was necessary to incur these expenses in connection with the fabrication of the lock-gate material, and as they have been charged as a part of the general expenses per ton of the structural-steel material passing through shop 2 during the lock-gate period, they should be added to the price fixed for fabricating the lock-gate material. These sums added together would make the cost of fabricating the lock-gate material under ordinary and normal conditions and ordinary and usual inspection, such as might have been anticipated under the original specifications—\$15.07 a ton. To this should be added 69 cents a ton to cover the increase in the general expenses in shop 2, due to a reduction in the output of shop 1 for the lock-gate period. A further sum of 30 cents a ton should be added to cover the increase in departmental-shop cost and general expenses occasioned by breakdowns in the power house of the Contractor. These two sums when added to the price per ton heretofore found—\$15.07—would make the total cost of fabricating the lock-gate material, independently of any excessive demands of inspectors—\$16.06 a ton.

The total cost per ton as shown was \$17.89. The difference, in the opinion of your committee, was probably due to abnormal conditions such as excessive demands, unreasonable requirements, delays, and interruptions in the manufacture on the part of the Isthmian Canal Commission, or lack of experience on the part of the Contractor in fabricating the water-tight work and work of the special character required in the lock gates.



In tabulated form the normal cost of fabricating the lock-gate material would have been as follows:

	Cost per ton.
Cost under original specifications-----	\$12. 03
Add for increased expenses caused by the Goldmark agreement of Aug. 8, 1910 -----	1. 80
Add for special equipment and tools not common to the class of material with which the lock-gate material is compared-----	. 97
Add for general expenses on account of purchasing a larger number of castings than is ordinarily required for other material-----	. 27
Add for increase in general expenses in shop 2, on account of the reduced output of shop 1 for the lock-gate period-----	. 69
Add for increased general expenses and departmental shop cost, due to reduced output of shop 2 on account of breakdowns in power house---	. 30
	<hr/> 16. 06

The item of \$1.80 added for increased expenses caused by the Goldmark agreement of August 8, 1910, includes any excess cost that might have been due to unreasonable inspection, and in the final statement will have to be reduced by the percentage of such excess cost as is found to be due to unreasonable inspection and requirements in excess of the specifications made by the Isthmian Canal Commission.

The departmental shop cost and labor cost for item 1 alone was \$471,242.64. The general and administrative expenses charged against this item were \$420,546.05, making the total charge of the departmental shop cost and administrative expenses on item 1, \$891,788.69. The total amount of material paid for under item 1 was 106,963.927 pounds, or 53,482 tons; \$891,788.69 divided by 53,482 would give a tonnage price for departmental shop cost and general expenses of fabricating material for item 1 of \$16.67. This does not include \$52,488.94 expended for special tools and equipment, nor does it include \$17,443.83 expended for general and administrative expenses in connection with other items of the contract. It does not include \$2,918.90 manufacturing expenses on items 2, 3, and 4, which are carried into the computation as to the manufacturing cost of the material above shown on the basis of 53,943 tons.

The price per ton as arrived at in this way is only 2 cents higher than the price arrived at on the basis of a tonnage of 53,943 and departmental shop cost of \$474,161.54, after making the necessary deductions for special tools and equipment to cover the general and administrative expenses on castings.

The above price per ton of the total expenses of item 1 is also in exact accord with a statement of the total cost of item 1 prepared by the Contractor and submitted to your committee, with the exception that in his preparation of the departmental shop cost of manufacturing item 1 and the spare parts for the gates a charge of \$14,918.10 for pickling material and plant is included. This should be excluded as not a proper charge against the labor cost of the material nor a proper element entering into the general expenses when compared with other material. These two methods of arriving at the departmental shop cost and general and administrative expenses per ton produce so nearly the same result that it is apparent that the sums spent for special tools and equipment and the sum spent in con-



nection with the general expenses for the purchasing of castings should not enter into the computation in determining the tonnage price at which the lock-gate material was manufactured for the purpose of comparing such price with the tonnage price of manufacturing other material for the year preceding and the year succeeding the lock-gate period.

On the basis just stated as to item 1, the general and administrative expenses of fabricating the lock-gate material were 89.2 per cent of the departmental shop cost.

The general and administrative expenses charged against item 1 should be reduced by \$36,902.58 to cover the 69 cents a ton increase in such expenses due to loss of output in shop 1 for the lock-gate period. When so reduced, the general and administrative expenses properly charged against this item, in comparing such expenses with other expenses against material passing through shop 2 for the year preceding and the year succeeding the lock-gate period, would be \$383,643.47; \$383,643.47 is 81.4 per cent of \$471,242.64, the total departmental shop cost and labor cost of item 1. This is a very low percentage of the departmental shop and labor cost for the general and administrative expenses. It is explained, however, by the fact that the departmental shop and labor cost is very high. The departmental shop and labor cost of item 1 is \$8.81 per ton; 81.4 per cent of \$8.81 would give the cost for general expenses as \$7.17 per ton. On this basis the cost per ton would be \$15.98, divided as follows: Eight dollars and eighty-one cents for departmental shop labor cost and \$7.17 as general and administrative expenses. The item of \$1.80 per ton for expenses caused by the Goldmark agreement, and the 30 cents per ton to cover the increased expenses due to breakdowns in the power houses, should be deducted from the departmental shop cost and general expenses in the proportion above shown. Applying this proportion, 95 cents should be deducted from the cost per ton of general expenses, leaving the general expenses per ton, \$6.22; and \$1.15 a ton should be deducted from the departmental shop and labor cost, leaving that at \$7.66 a ton; \$7.66 plus \$6.22 would make \$13.88 a ton as the cost of fabricating the lock-gate material under the original specifications after making allowance for increased cost due to all causes other than the severity of inspection or unreasonable or excessive requirements of the Isthmian Canal Commission. Compared with the cost of fabricating all material passing through shop 2 for the year immediately preceding and the year immediately succeeding the lock-gate period, this cost is \$1.85 a ton greater.

Each of the methods stated above of arriving at the excess cost per ton due to abnormal conditions produce substantially the same result; i. e., in the first case there is an excess of \$1.83 a ton, and in the second case, when the material on item 1 alone is considered, there is an excess of \$1.85 a ton.

As heretofore stated, this much of the excess cost is certainly due to the excessive demands, unreasonable requirements, delays, and interruptions in the manufacture of the material on the part of the Commission, or to the lack of experience on the part of the Contractor with water-tight work and work of the character required in the fabrication of the lock-gate material, or to one or both of these causes combined.



There will have to be added to the price per ton above fixed as showing the difference, the percentage of the \$1.80 a ton that is due to excessive demands made by the Isthmian Canal Commission.

The specific contentions on which the second claim considered above is based are stated by the Contractor on pages 7 and 8 of the claim, as follows:

Second. That the Commission's engineers and inspectors demanded and received shopwork of a much more refined and costly character than that called for by the contract.

That for a long time both the engineering and inspecting organizations of the Commission at the shop were inadequate to handle the work.

That the Commission's shop inspectors were at times unreasonable, indecisive, and inconsistent, creating in the shop organization a state of uncertainty as to what would be acceptable to the inspectors.

That the Commission's engineers and inspectors forced the Contractor to make the sizes of the subpunched holes smaller than clearly specified in the contract specifications.

That all this very much delayed the progress in the shop, increased the manufacturing cost, diminished the shop output, and held up and increased the work in the field to such an extent that an enormous expense was incurred in order to complete the work in the time required.

The Contractor claims that the character of the work he was required to do under the specifications was indicated by the following provision in the invitation:

In making the award no bidders will be considered who are not manufacturers of high-grade structural, bridge, or ship work of such character as is required in the specifications, or whose facilities for furnishing the material in the time specified and of the quality required shall not be, in the opinion of the Commission, sufficient for the purpose.

The general provision in the invitation seems to have been intended to limit the bids to manufacturers of a special character of work. The Contractor certainly had no right to accept this statement as in any way limiting or defining the specific requirements set out in the specifications as to the character and finish of the work. It is claimed, however, that the shop work demanded and received was more costly, more accurate, and more highly finished than was required for first-class workmanship under the specifications. It is claimed that the work should have been fabricated in the shop with the same care and methods that the Contractor had been accustomed to using on high-class bridge and structural-steel work, but that in place of allowing the material to be fabricated in the shop in this way the demands as to accuracy and finish in the work made by the Isthmian Canal Commission's inspectors were such that it practically became a machine-shop job. (See pp. 16, 17, 18, 19, 20, 21, and 22 of the claim.)

Before the contract was let to the McClintic-Marshall Construction Co. the question as to whether they had the proper shop equipment and facilities to perform the contract was investigated, and it was determined that the Contractor was well equipped to perform the work called for under the specifications. (See testimony of Maj. Boggs, General Exhibit 23, vol. 23, pp. 71 and 72.)

On page 18 of the claim the Contractor makes a statement of some of the important and unreasonable demands which it is claimed were made by the inspectors on the shop workmanship.



This statement reads as follows:

(a) The precision demanded in the spacing of the punched and drilled holes was so exacting that the Contractor was obliged to abandon, except for the first eight leaves fabricated, his customary method of using wooden templets and substitute therefor steel templets and arrange to punch the holes smaller diameter than called for by the specifications.

(b) It was required that the plates be turned and calipered in the shop before any work was done on them, a most unusual and unreasonable shop requirement.

(c) Plates and shapes, as commercially rolled, are never theoretically perfect either in finish, dimensions, or shape. Nevertheless, in a number of the different parts the Contractor was compelled to correct these imperfections by an excessive amount of work.

(d) The workmanship required on the turned bolts was of such an exacting nature that the Contractor was compelled to abandon the manufacturing of them. These bolts were subsequently made by another concern by a man whom the Contractor had employed on machines of the same make as those on which the bolts were finally made.

(e) The unreasonableness in the inspection is also shown by the causes for which a large amount of material was rejected at the shop before and after fabrication.

A very large part of the claim of the Contractor is based upon the increased expense which, it is claimed, resulted from the great accuracy in the spacing of the holes demanded by the Isthmian Canal Commission's inspectors. It is insisted that the accuracy demanded was so exacting that it could not be met by using wooden templets, as had been customary, and that in order to meet that accuracy it was necessary to substitute steel templets and punch the holes of smaller diameter than called for in the specifications.

The first eight leaves were fabricated substantially in accordance with the requirements of the contract as interpreted by the Contractor. (See Guynn's testimony, General Exhibit 6, vol. 6, p. 11; testimony of C. M. Neeld, Exhibit 23, vol. 23, p. 11; and testimony of Thomas Conley, General Exhibit 22, vol. 22, p. 11.)

On page 11 of the testimony of Mr. Guynn he was asked this question:

I will get you to describe, Mr. Guynn, the general character of the inspection of that material and any rules by which you were guided in making the inspection.

A. At the time the contractor started the fabrication of the material, which was, if I remember correctly, some time during the middle of November, 1910, they began fabricating the material first for the girders, and in the meantime followed along with the sheathing plates, intercosal framing, and some few water-tight frames and nonwater-tight frames. During that time the drawings were accessible, showing the size, location, and requirements for that class of work. Each of the inspectors had their instructions in connection with the part which he was following, which he was to look out for. They were instructed not to exact the inevitable; to accept any part of the work that they thought would be satisfactory to themselves; and if there was any doubt to refer the matter immediately to me. And during that time I was there, if I remember correctly, the only material that was fabricated was that portion of contract 4845, eight leaves for the 54-foot 8-inch gates—a portion of it only.

Describing the inspection during this period, Mr. Neeld states, in response to the question:

Do you know the method of inspection that he adopted [referring to Mr. Guynn] in connection with the fabrication of the material for the lock gates as it went through the shop?

A. Well, I could not say I ever discovered any method that was used, but at least it got results that were satisfactory to us. The method of inspection was such that they seemed to be rambling all over the shop, everywhere and anywhere, finding fault and making sort of informal kicks, and, I suppose, more



or less formal ones; but it was very hard to get down to definite, particular things. Under the question of the reaming of those holes, which was a modification, I believe, on the contract, of reaming the diaphragm holes to templates—that was one of the first questions that came up—the absolute exactness that was required, if I remember correctly, with my memory somewhat refreshed from reading those letters; but that was a comparatively small matter in our shop.

Mr. Conley was asked this question:

In the early part of the work, in December, 1910, and January, 1911, prior to the assembly of the first leaf, is it not a fact that the inspection of the material in the yard was carried on very much like they carry on the inspection of bridge work in the shop?

A. Yes; I think that was about the way it was carried on, according to my recollection.

Q. After they began the assembly of the first leaf in the yard, what were the principal difficulties that they found with the material, in assembling it?—

A. The question was raised about the sheathing plates not matching up with the holes in the girders.

Q. Were there any others?—A. That was the principal question that was raised, according to my recollection. A hole would be a small part out—for instance, one thirty-second of an inch out—from matching up, and the question came up that the work was not right on that account, whereas in all bridge shop practice that work is all right, particularly when punched small and reamed out to a large size. But we did have trouble with Mr. Hammer because these holes would not match out.

In a letter dated March 1, 1911, Exhibit No. 1, testimony of Mr. Guynn, General Exhibit No. 6, volume No. 6, the statement was made:

The Contractors began to assemble one leaf, No. 37, of the 54-foot 8-inch high gates January 28, 1911, and worked on the same continuously until the leaf was four panels high, when it was noted that the upstream sheathing and doubling plates did not member with the holes in the chord angles on the girders. February 15, 1911, the Contractors stopped work on the erection of the leaf and the assembling of girders to make steel templates to check all material that had been previously manufactured for the above contract. On February 27, 1911, the Contractors began to assemble the second section of the leaf and the fitting of the bent end plates on quoin end of the first section erected.

This letter also gives in detail the various points wherein the material seemed to be deficient.

In fabricating the material during December, 1910, and January, 1911, it seems to be a fact that the inspection was practically of the same character as the Contractor thinks should have obtained throughout the work, except as to the accuracy demanded in the spacing of the holes.

Paragraph 120 of the specifications provides:

In order to detect any errors in the templates, etc., the contractor shall erect at his works without charge one complete leaf of each different height included in his contract. Such leaves shall be carefully assembled and bolted together, but are not to be riveted up nor have the rivet and bolt holes reamed. Each piece in these leaves shall be match marked, so as to facilitate reassembling. All other leaves of the same height shall be built from the same templates but need not be erected in the shops. Any errors in the templates or elsewhere, found during the shop erection, must be corrected in all leaves.

On the assembly of the first section of the leaves under the above provision, the Isthmian Canal Commission's inspectors discovered what they consider to be an unreasonably large number of unfair holes and claimed that the work had been fabricated so as to produce unsatisfactory results.

In a report made by Mr. Guynn to Mr. Hammer, under date of February 15, 1911, Exhibit 9, testimony of Mr. Neeld above referred to, he states:

The Contractor has assembled one leaf of the 54-foot 8-inch high gate, 4 panels high. The work in general is unsatisfactory.

In a report made by Mr. Guynn to Mr. Hammer, under date of 1911, he states:

The Contractors have assembled one leaf of the 54-foot 8-inch high gate, 4 panels high.

The erected parts of the 54-foot 8-inch high leaf don't match as well as should be expected, especially is it noted that rivet holes in the girders run somewhat irregular. The Contractors have, upon my request, made steel templates which are now being used in checking up all girders in order to ascertain which girders can be considered as interchangeable members.

A high degree of accuracy in the shopwork is required in order to get everything to match properly. Such accuracy is being demanded, and the Contractors are working to reach this result.

The number of unfair holes in the first 80 girders, contract 4845, were taken from the work reports and shown in detail in a report in tabulated form and turned over to Mr. Hammer March 2, 1911, copy of which appeared in connection with the testimony of Mr. Neeld (Exhibit No. 10), General Exhibit No. 23, volume of testimony No. 23.

The table below gives the totals as taken from this report:

No. of girder.	Number of holes.	Number of fair holes.	Number of unfair holes.	Per-centage.
1 G 13 R (jiged holes).....	406	362	44	11
1 G 13 R (total holes, report not complete).....	2,088			
2 G 13 R.....	2,086	1,976	110	5.2
3 G 14 R.....	2,086	2,008	78	3.7
4 G 14 R.....	2,086	1,934	152	7.3
5 G 14 R.....	2,086	1,989	97	4.6
6 G 14 L.....	2,086	1,968	118	5.7
7 G 14 L.....	2,086	1,981	105	5
8 G 14 L.....	2,086	1,977	109	5.2
9 G 14 L.....	2,086	2,013	73	3.5
10 G 14 L.....	2,086	1,996	90	4.3
11 G 14 R.....	2,086	2,010	76	3.6
12 G 14 L.....	2,086	1,992	94	4.5
13 G 15 R (report not complete).....	2,086			
14 G 14 R.....	2,086	1,954	132	6.3
15 G 14 L.....	2,086	2,003	83	4
16 G 14 L.....	2,086	1,929	157	7.5
17 G 14 R.....	2,086	2,012	74	3.5
18 G 14 L.....	2,086	1,965	98	4.7
19 G 14 R.....	2,086	1,920	166	7.9
20 G 13 and 14.....	2,086	1,968	118	5.6
21 G 13 L.....	2,086	1,971	115	5.5
22 G 13 L.....	2,086	1,979	107	5.1
23 G 13 L.....	2,086	1,969	117	5.6
24 G 13 R.....	2,086	2,031	55	2.6
25 G 13 L.....	2,086	2,048	38	1.8
26 G 13 L.....	2,086	1,596	90	4.3
27 G 13 L.....	2,086	1,976	110	5.2
28 G 15 L (report not complete).....	2,112			
29 G 13 R.....	2,086	2,004	82	3.9
30 G 13 R.....	2,086	1,997	87	4.2
31 G 13 R.....	2,086	2,020	66	3.1
32 G 20.....	2,078	1,976	102	4.9
33 G 13 L.....	2,086	2,030	56	2.7
34 G 15 R (report not complete).....	2,112			
35 G 15 L (report not complete).....	2,112			
36 G 15 R.....	2,112	2,050	62	2.9
37 G 15 R (report not complete).....	2,112			
38 G 13 L.....	2,112	2,051	61	2.9
39 G 13 L.....	2,086	2,057	29	1.4
40 G 13 R.....	2,086	2,030	56	2.7
41 (no report).....				
42 G 20.....	2,078	2,010	68	3.2



No. of girder.	Number of holes.	Number of fair holes.	Number of unfair holes.	Per- centage.
43 G 20.....	2,078	1,985	93	4.4
44 G 20.....	2,078	2,000	78	3.7
45 G 20.....	2,078	1,947	131	6.3
46 G 2 R.....	2,370	2,269	101	4.3
47 G 20.....	2,078	2,053	25	1.3
48 G 5 R.....	2,120	1,990	130	6.1
49 G 20.....	2,078	2,044	34	1.6
50 G 20.....	2,078	1,992	86	4.1
51 G 21 R.....	2,066	1,960	106	5.1
52 G 21 L.....	2,066	2,056	10	.5
53 G 21 R.....	2,066	2,014	52	2.5
54 G 21 L.....	2,066	2,006	60	2.9
55 G 21 L.....	2,066	1,990	76	3.7
56 G 21 L.....	2,066	2,006	60	2.9
57 G 21 R.....	2,066	1,972	94	4.5
58 G 21 L.....	2,066	1,979	87	4.2
59 G 22.....	2,064	2,057	7	.3
60 G 22.....	2,064	2,050	14	.7
61 G 22 (report not complete).....	2,064			
62 G 22 (report not complete).....	2,064			
63 G 22.....	2,064	1,988	76	3.7
64 G 23 (report not complete).....	2,064			
65 G 23 (report not complete).....	6,064			
66 G 23 (report not complete).....	2,064			
67 G 17 R (report not complete).....	2,587			
68 G 23.....	2,064	2,017	47	2.3
69 G 23.....	2,064	2,009	55	2.6
70 G 23 (report not complete).....	2,064			
71 G 23 (report not complete).....	2,064			
72 G 22 (report not complete).....	2,064			
73 G 22 (report not complete).....	2,164			
74 G 22 (report not complete).....	2,064			
75 G 22.....	2,064	2,013	51	2.5
76 G 5 L (report not complete).....	2,120			
77 G 5 R (report not complete).....	2,120			
78 (report not complete).....				
79 (report not complete).....				
80 G 5 R (report not complete).....				

The above table is the table referred to in Mr. Guynn's report to Mr. Hammer dated February 28, 1911, Exhibit No. 3 (Guynn) in General Exhibit No. 6, volume No. 6, of testimony. In that letter Mr. Guynn stated:

I have been informed that the material that has been worked for the 77-foot gates may not be used after making new templates.

He also stated:

Very little work has been done in shop since February 15, 1911, with the exception of checking and making new templates.

The total rejections of which the Isthmian Canal Commission inspectors made a record for oblong and mispunched holes amounted to 122,507 pounds. Of this amount 94,900 pounds was rejected on contracts Nos. 4845 and 4847. Contract 4845 is for the 54-foot 8-inch leaves, all of the material of which was punched in accordance with the original specifications. The material rejected under contract No. 4847 was material that was laid off and punched prior to the time that it was determined to change the size of the holes. It appears, therefore, that nearly all of the rejections that were made for mispunching and inaccurate spacing of the holes were made on the material that was punched or the holes drilled in accordance with the original specifications. (For list of rejected material and the weights of the rejections and the causes for which the rejections were made see Exhibit No. 8 in Price's testimony found in General Exhibit No. 18, vol. 18.)

During the time that the shop was practically shut down, that is from February 15 to some time in March, and was checking up the material with steel templates that had been made for that purpose, Mr. John N. Ostrom, of Pittsburgh, Pa., an expert bridge engineer and shop inspector, was requested to make a personal examination of the conditions at the plant and the way in which the work was being fabricated with a view to his employment as a supervising engineer by the Contractors. (See testimony of Mr. Ostrom, General Exhibit 19, vol. 19, pp. 37 to 58, inclusive.)

On page 46 of the testimony just cited Mr. McClintic makes a statement explaining the reason for the employment of Mr. Ostrom and the purpose which the McClintic-Marshall Construction Co. intended to accomplish by his employment:

Our experience with Mr. Ostrom is—we have known him for—well, I have known Mr. Ostrom I think for 27 years, something like that; and when we were connected with the old Schiffler Bridge Co. before our company was formed, Mr. Ostrom inspected a considerable amount of work here for the different railroad companies, and we had always noticed that he did his work very carefully and accurately.

When we contracted for the Beaver bridge, it was a very particular piece of work, being of the cantilever construction; and we felt that we would save many a dollar by employing Mr. Ostrom as an outside inspector, to supervise not only the railroad company's inspectors, but our own inspectors, and catch up any errors that might pass either of them. Mr. Ostrom performed his work so well on the Beaver bridge that we felt justified in employing him on any similar structure in the future that we might have where particular care was required.

When we ran into this trouble with the inspectors on the lock gates our first thought was of Mr. Ostrom, and we called him up, as I remember, and had a conference with him and offered him a position to supervise the inspection of this work, and at the same time, being an outside inspector, he would be uninfluenced by any other consideration except to get good work.

Now, Mr. Ostrom came out to the plant and looked over the work and talked with Mr. Hammer and other inspectors there, and, as I understand it, he found that the requirements of the Government as interpreted by Mr. Hammer and his inspection force were so severe that he could not obtain the kind of work that was required. So, rather than undertake that work and not get satisfactory results, he would not undertake it at all.

Mr. OSTROM. Yes; that is right.

Mr. Ostrom, after an examination of the work, wrote a letter to Mr. H. H. McClintic, vice president and general manager of the McClintic-Marshall Construction Co., giving his reason why he did not wish to accept employment as supervisor of the work. The original of this letter is Exhibit No. 1 in Mr. Ostrom's testimony, General Exhibit No. 19, volume No. 19. Mr. Ostrom was asked this question:

Q. Did you explain to Mr. McClintic in more detail than appears here in this letter why you thought the requirements of the Isthmian Canal Commission's inspectors were impossible of ascertainment, or at least impracticable?—A. My remembrance is that I had a set of drawings, and that I had been over those girders that were set up in the yard; that I had measured up all the specified rivets carefully; and that I had a record of that; and that I showed that—well, to Mr. McClintic and probably to the manager. I know I spent several days there; I do not remember how long. It was not a long time, but it was long enough to go over the whole thing and measure it all up, and I did not make any decision until I had examined all the points; and my remembrance is that that was all recorded on drawings, but I do not think I ever made any report, except a verbal report, and I can not remember what became of those drawings; I think they were notes made on blue prints or sketches that I either made or had made for the purpose. I went over it very carefully and made my statements on what I saw myself. (See pp. 47 and 48 in vol. 19 of the testimony.)



On page 49 Mr. Ostrom was asked this question:

Q. Did you make a study of the requirements that had to be met in order to make the gates build up accurately?—A. Yes.

Q. And miter properly at the respective ends?—A. Of course, the building up of the girders in these gates depended entirely on the spacing of the rivets and getting them the right length so that they would be accurate in dimensions. I went over all that.

Q. Did you ever superintend the construction of any work where there were as many rivets requiring such accurate spacing as was required in these lock gates?—A. Yes; I think the girder work of all bridges, like drawbridges and long-span bridges and bridges generally, is just as accurate and requires just as close work as the work on the girders in the Panama locks, and I have had years and years experience in that.

Q. Then why was it that you thought this work was impossible and that you could not do it?—A. Simply because I talked with Mr. Hammer and expressed my opinion about the reasonableness and unreasonableness of certain kinds of work. For instance, to punch you have your drawings giving certain specified length and height and width. Now, it is a comparatively easy matter to punch one dimension and make them all fit—length, for instance. Then, if you add to that height, why, that increases the trouble. But, now, when you have width, four or five girders connected by diaphragms in between, where you have got to contend with the thickness of the material and putting one plate against another and building out wider—when you come to punch that dimension and get that also to be so accurate that after it is punched you can ream that out to the dimension and get a smooth hole—and that is what he was requiring; and I suggested to him that it would be possible to overcome that by reaming out larger—or, where it was necessary, if material had been badly punched and it was in tension and affected the stability of the structure, instead of throwing it all away, why, put on an extra piece to overcome that, and in case of compression the extra-large holes would not destroy area and would actually benefit the structure. I explained to him that that was what we always did in first-class bridge work; and I stated that I thought it ought to be done in this contract; that if it were done in a spirit of doing the best thing that could be done under the circumstances, that the work could be done. Now, he did not listen to me with any consideration at all; he did not admit that.

Q. What did he say about it?—A. He insisted that the material could be punched and reamed and put together with all three dimensions accurate according to the specifications; and I did not agree with him; I knew that it could not be done.

Q. Do you know whether it was actually done afterwards or not?—A. It was not done on those that I looked at, and if it was done afterwards, why it was certainly a great achievement; no bridge has ever been built that I have ever seen in this country, and no set of engineers, that I know of, have ever required to have every hole punched so accurately that it would clean up. I considered it very unreasonable.

Q. Well, do you know what percentage of holes Mr. Hammer would allow to pass that were not punched accurately? Did he tell you the percentage that he would allow of bad holes before he would reject the pieces?—A. No; he did not. I did not understand that he would pass any percentage. He might have decided on that afterwards, but he never told me that he would consider a certain percentage.



On page 58, Mr. McClintic asked Mr. Ostrom the following question:

Q. Did you consider the requirements of Mr. Hammer beyond all reason, and that you could not obtain such accuracy on the work?

Mr. OSTROM. Yes; that is what I considered it. That is the reason I threw it up.

The evidence establishes the fact that the Contractor did not believe that he could fabricate the work with the precision demanded in the spacing of punched and drilled holes by the Isthmian Canal Commission's inspectors under the customary method of using wooden templates. It also establishes the fact that it was thought necessary by the Contractor, in order to reach the precision demanded in spacing holes by the Isthmian Canal inspectors, to reduce the size of all subpunched subdrilled holes to eleven-sixteenths inch in diameter. After the fabrication of the material for the first eight leaves and a part of the material on contract No. 4847 being for the 77-foot leaves, the Contractor did abandon his customary methods of using wooden templates and did reduce the size of the holes to eleven-sixteenths inch in diameter. Whether or not he was obliged to do this by reason of the precision demanded by the Isthmian Canal Commission, or whether the inaccuracy in the work had been due to his own carelessness in the method of fabricating, will now be considered.

The principal witnesses who had personal knowledge of the character of the inspection and the manner in which the work was being fabricated prior to February 23, 1911, when the change was made to punch all holes eleven-sixteenths inch in diameter, are:

Mr. George F. Guynn, chief inspector of the Isthmian Canal Commission (General Exhibit No. 6, vol. No. 6).

Mr. Thomas Conley, general superintendent of the Rankin plant of the McClintic-Marshall Construction Co., from 1906 to 1915 (General Exhibit No. 22, vol. No. 22).

Mr. C. M. Neeld, manager of the Rankin plant of the McClintic-Marshall Construction Co. during the latter half of the year 1910 and until June 1, 1911 (General Exhibit No. 23, vol. No. 23).

Other witnesses having personal knowledge of the character of the material after it was fabricated, and the manner in which it was fabricated from an inspection of it in the yard or from an examination of much of the material after it was fabricated, and also having knowledge of the requirements of the contract, are:

Mr. Paul L. Wolfel (General Exhibit No. 7, vol. No. 7).

Mr. Henry Goldmark (General Exhibit No. 8, vol. No. 8).

Mr. W. E. Crane, who succeeded Mr. Guynn as chief inspector (General Exhibit No. 5, vol. No. 5).

Mr. Frank Price, who succeeded Mr. Crane as chief inspector May 5, 1911 (General Exhibits Nos. 10 and 18, vols. Nos. 10 and 18).

Mr. C. D. Marshall, president of the McClintic-Marshall Co. (General Exhibit No. 10, vol. No. 10).

Mr. Howard H. McClintic, the vice president of the McClintic-Marshall Construction Co.

Mr. John N. Ostrom.

Mr. Walter N. Wagoner, chief inspector of the McClintic-Marshall Construction Co., all (General Exhibit No. 19, vol. No. 19 of the testimony).



Mr. Guynn was asked on page 19 of his testimony above referred to:

Q. Mr. Guynn, do you know why the Contractors changed their method of manufacture and abandoned the wooden templates for steel templates?—A. (On p. 20.) Well, I could not say exactly, other than that they thought perhaps—and I thought so, too—that they could obtain better results after the assembling of the first section of that leaf.

Q. Then, the object of using the steel templates instead of the wooden templates was to obtain greater accuracy in the work?—A. I think so.

Mr. Guynn was then asked the question:

Q. I will get you to state just what demands you made on the McClintic-Marshall Construction Co. as to the spacing of the punched and drilled holes in the material that you inspected?—A. Well, it sort of avoided question. In the first place, we could never tell until when, at different times, they began to assemble and bolted up and found out the condition of the holes, whether they were fair or unfair, or whether the joining member was going to be fair with the same original hole that was punched. The question came up, I think, when they assembled the first girder. It was noted that the holes in the upstream chord angles in the curved end seemed not to be in line, when it was known that the same holes that were matching it were in line in the covered plates and sheathing plates. It was due, practically or possibly, to the fact that the angle on the inner side would slip a little bit one way, and the angle on the inner side would slip a little the other way. Well, we noted it and talked the matter over with the contractors fully several times, and we were trying to get some way to overcome it by placing the centers, and working from the centers on the girders. But even then we noted these conditions; but we could not avoid it. We had the material for those girders punched, and some others ready to be assembled. So I could not see any other way, and suggested that we wait and put one up and see how badly off we really were when we came to match the material to it. And the first section of the leaf erected was the result, or the proof, of it.

Q. Well, I will ask you if the necessity for making the change in the templates, as claimed here, arose from any excessive demands made on the contractor by the inspectors?—A. Not unless they were made by Mr. Hammer, the engineer, himself.

Q. I will ask you to state if, in your judgment, the inherent character of the work and the method of performing it, would not account for the extreme difficulty in properly spacing the rivets, to a certain extent?—A. I did not quite understand that question.

Q. The statement is made by the Contractor here that the precision demanded in the spacing of the punched and drilled holes was so exacting that the Contractor was obliged to abandon, except in the first eight leaves fabricated, the customary method of using wooden templates.—A. Well, it was the same thing that was determined in erecting this leaf, with the number that I have just read of unfair holes on both the upstream and downstream sides.

The letter referred to in the last answer of Mr. Guynn is Exhibit No. 1 of Mr. Guynn's testimony, dated March 1, 1911, and is as follows:

BRADDOCK, PA., *March 1, 1911.*

Mr. J. HAMMER, *Assistant Engineer.*

SIR: The following is a memorandum regarding the erection of one leaf of the 54-foot 8-inch high gate, contract No. 4845:

The contractors began to assemble one leaf No. 37 of the 54-foot 8-inch high gates January 28, 1911, and worked on the same continuously until the leaf was four panels high, when it was noted that the upstream sheathing and doubling plates did not member with the holes in the chord angles on the girders. February 15, 1911, the contractors stopped work on the erection of the leaf and the assembling of girders to make steel templates to check all material that had been previously manufactured for the above contract. On February 27, 1911, the contractors began to assemble the second section of the leaf and the fitting of the bent end plate on quoin end of the first section erected.



[Comments on leaf No. 37, 54-foot 8-inch high gates, that is being assembled.]

(1) The bottom girder, mark C-2, was placed in position without the water-tight staple at the miter end being fitted in place. This staple has been fitted in place lately, but has not been riveted.

(2) The upstream chord angles do not fit tight against the heel casting.

(3) The downstream sheathing plates were assembled in leaf without the reinforcing plates around manholes.

(4) Through an error in laying off the jig holes for diaphragms A at the miter end between the bottom and next to bottom girder, it will be necessary to fit new angles on diaphragm A and match mark the same (also mark special).

(5) The water-tight diaphragms B was placed on leaf and removed on account of it being a little deeper than called for on plan and the packing out of the reinforcing plates on the girders. When this diaphragm was in its position on the leaf, it projected very nearly five-sixteenths inch above the top of the heel casting. It is also noted that the offsets on the top corners are not crimped in accordance with the approved plans, and the manner in which the staple angle is worked on this diaphragm is not fitted in accordance with the general method of manufacturing staple angles for water-tight work.

(6) The bottom fender angles have been bolted in place without being beveled, and are not regulated to the required width as called for on plans.

(7) Water-tight frames marked W. F. 9 and WW. F. 16½ R. are cracked in the offset at corners, also two of the electrically welded butts of the angle staples are cracked. It is also noted that several of the water-tight frames are not drawn to a tight seating on webs on account of the chord angles not fitting the offsets of the frames.

(8) The toe of the far side chord angles on the bottom girder projects one-eighth to three-sixteenths inch below the planed edge of the bottom sheathing plate, which makes difficult and expensive calking. This projection extends nearly one-half the length of leaf on the up and down stream sides on miter end.

(9) Splice plate on downstream sheathing on lower panel has been planed 18¾ inches instead of 19 inches. This causes the short section of the fender angle to project one-fourth inch beyond the splice plate.

(10) Downstream cover plate C-5 has three miss-punched holes, one of which has been punched double near the butt at the quoin end.

(11) The holes in the upstream sheathing plate in the third panel at the miter end does not member with the holes in the doubling plate, and two lines of holes have been omitted in the same in way of diaphragm B. This place may be incorrectly marked; if so, it could be fitted on the right-hand leaf with better results.

(12) The space for the wedges between the doubling plate and the end reaction castings do not seem to be uniform, due, in my opinion, to the unfairness of the sheathing plates. This can be reduced to a certain extent when the sheathing is riveted.

(13) It was noted that during the assembling of the first section of the leaf girder No. 5, marked G-14-R, was placed in position on the leaf and was removed and another girder of the same number placed in its stead. The first girder that was assembled did not member with the diaphragms A. This girder was checked for exact measurements and found to be five-sixteenths inch longer on the upstream side than called for.

(14) On February 27, 1911, the Contractors began to reregulate and bolt up the first section of the leaf assembled, with much better results than it was in the beginning. There are about 446 unfair holes in the downstream sheathing and 648 in the upstream sheathing, in my opinion, that will not ream clean with a straight reamer.

(15) The end reaction castings have been placed on the miter and quoin ends of the leaf four panels high and seem to member and check to height fairly well. Attached find sketch showing heights of end reaction castings taken on leaf.

(16) The miter end of the leaf is a little out of plumb and the Contractors are trying to correct the same.

(17) The Contractors have also erected two additional sections of the above leaf. The method following in erecting these two sections consisted of erecting the skeleton first and adjusting everything before any sheathing is put on, and will, in my opinion, give much better results.

Very respectfully,

GEO. F. GUYNN,  
*Inspector, Isthmian Canal Commission.*



This letter relates wholly to material that had been fabricated before the change was made to steel templates and the change to small holes was determined upon.

Mr. Guynn further testified as to the reasons for the change from wooden templates to steel templates as follows:

Q. Then the only thing you did demand as inspector was that the work should go together accurately when you assembled it?—A. As near to that as possible.

Q. What?—A. As near to that as possible, for proper acceptance.

Q. For proper acceptance?—A. Yes.

Q. Do you think it was more difficult for them to obtain proper results with wooden templates, in the character of work they were doing on the lock gates, than it would have been to obtain similar results on ordinary ship work?—A. Well, to a certain extent I would say yes; owing to the fact that the template in the lock-gate work had to be used so many more times than it would on ship work.

Q. Well, what would be the tendency of the use of the templates of wood?—A. Well, the wood would warp. In many instances it would alter its shape; if it was not thoroughly seasoned it would have a tendency to warp, in some instances.

On page 27 Mr. Guynn was asked this question:

Q. Mr. Guynn, I find this statement in one of Mr. Hammer's reports to the Isthmus. Mr. Hammer reported on February 16, 1911: "A high degree of accuracy in the shopwork is required in order to get everything to match perfectly. Such accuracy is being demanded, and the Contractors are working to reach this result." Can you tell me, from your understanding and the work that you did there, and in view of the instructions that you received from Mr. Hammer, what was regarded by the inspection force and by Mr. Hammer as a high degree of accuracy in connection with this work?—A. Well, I can only answer that question by making this statement: That Mr. Hammer adhered very closely to the specifications, and we wanted it, and exacted it, as near perfect as it could be gotten; they were held very close to the specifications. But if I was in doubt—ordinarily if it looked satisfactory to me I would accept it—but if I had any doubt whatever I would refer the matter to him and wait for him to pass upon it.

On page 29 Mr. Guynn was asked the following questions:

Q. Mr. Guynn, is it not a fact that almost all of the difficulty that occurred in having the material under contract 4845 for the 54-foot 8-inch gate leaves accepted resulted from errors that were developed in assembling the leaf?—A. Yes; they developed in assembling the leaf.

Q. I will ask you to state if there was any practicable way of determining whether or not the errors existed before the assembling of the leaf?—A. Well, I should say that they must have existed before the assembling.

Q. Well, I mean that could be determined?—A. Well, no, sir; I would not say so. For instance, we had hundreds and hundreds of chord angles; some were bent and some were not bent. Numbers and numbers of them were punched with a double hole, double spacing in each flange; it would have been impossible for any corps of inspectors to even attempt to get in amongst the material, with the contractor's force at work, and check the number of holes in each of those chord angles, where there were hundreds and hundreds of them, and hundreds and hundreds of angles; and in the meantime you could not detect it in every instance, because it depended sometimes on the manner in which it was assembled; if one was slipped a little bit one way and the other one going in the opposite direction, that doubled the error. So that shows to me conclusively that in the first beginning the assembling did show up the errors. There were some minor ones, as I stated before, shown when I noted the holes in the chord angles; but the main part of them showed up only after being assembled.

Mr. Crane reported on the work of the McClintic-Marshall Construction Co. some time in February, 1911. He became chief inspector, succeeding Mr. Guynn, March 6, 1911. In response to a



question as to what condition he found the work in at Rankin shop No. 2 when he took charge, Mr. Crane stated (p. 6) :

A. For about 30 days previously the shop had been closed, and they were making steel templates to check the work on the girders and various other members of the leaves. There was considerable work in the yard, and at the time they were measuring up the leaves and checking them with these steel templates. (See p. No. 6 of Crane's testimony.)

In reply to a question as to what the contractors were doing at the time he took charge, he added (p. 8) :

A. They were measuring up the perimeter of the angles, both upstream and downstream, checking the punching of the sheathing plates to compare with these measurements on the angles of the girders; they were also checking the placing of the stiffeners or the water-tight frame-plate positions on the girders and also the position of the A and B frames on the girders.

Q. Now, Mr. Crane, did you superintend that measurement?—A. I did, from the date I was on there—yes; when I went on the work.

Q. Why was it necessary for the shops to close during this measuring up?—A. I can not understand why they closed up; they could have continued on the work in the shop, but I understand that they wanted to verify and check up these inaccuracies and make make new templates before they continued the work.

Q. Now, do you know what kind of templates they had been using up to that time?—A. On certain parts of the work they had been using wooden templates, some of them steel templates; a large part of the work was done by multiple punching—multiple machines, which we call multiple punchers.

Q. Well, what kind of templates did they use?—A. They use wooden templates on the multiple punchers, and they use wooden templates on some of the forging, or some of the blacksmith shop work; on milling and boring they always use steel templates.

Q. Did they make steel templates for the purpose of checking up and measuring the work in the yard from the time you took charge?—A. Yes; they arranged for long steel plates accurately punched, and then bolted them onto the angles of the girders, and marking the holes of each of the girders, and thus checked the position of the holes on the girders with the corrected templates.

Q. What was the particular objection, if any, to the work and to the character of the work as it was being assembled at the time you took charge?—A. In the punching of the material, say, the angles, from one end, there appeared to be a creeping of all of the holes, so that when we reached the other end of the perimeter, the holes were out of their proper position, also in the punching of the plates—sheathing plates—in punching plates from one end to the other, there was a creeping of the holes toward the latter end, and the position at the latter end was not proper.

Q. What do you mean by the latter end?—A. The last end—the farther end.

Q. They will not appear; explain what you mean by that.—A. I will explain it this way, that we start in at this end, with a series of plates.

Q. Which end?—A. With the beginning; here is the machine [indicating by rough sketch], placed in the machine, and a row of multiple punches.

Q. Was there any system as to which end of the plate was to go in?—A. No, sir; no system. Any end—either end could be taken unless the holes were different, but what I mean is on the naked plate itself; they could turn any frame whichever they wanted; they drew this through the punch, punching series of holes until they reached the end of the plate, and completed the punching. When all the plates were punched and nested together, they were practically perfect; but in orienting and returning the plate, then came the discrepancies.

Q. What do you mean by "orienting"?—A. Reversing the plate end for end or side for side; we can take the plate, say we punched a one-half dozen plates that way, beginning with this end, "A" [indicating by rough diagram], and continuing to "B." Now, if we take and place that plate "A" here [indicating] properly, and take and place "B" properly on it, it was all right; but if we place the "A" end at the "B" end, or the "B" end at the "A" end, making the plate interchangeable, or if we reverse the plate, putting the bottom to the top, then the holes did not coincide.



Q. Was it intended—was it required in the specifications that the punching of the plates should be such that the holes would coincide whatever end or whatever way the plates might be placed?—A. It was required that each plate of the same pattern should be interchangeable, so you could reverse it any way, or turn it over, and the trouble was then that the plates and the manner in which they have been punched were not interchangeable and with perfect holes.

Q. Now, could the—what action was finally taken in connection with that defect?—A. More careful work was done and more careful and more correct templates made; the principle is the same all the way through; it was simply in the method of work and in the accuracy of the work.

Q. Then, your understanding of the holding up of the work at that point was that it was due in part to the fact that the holes have not been accurately punched? Is that right?—A. Yes; that they had not been accurately punched, or the templates not accurately made.

Mr. Crane's statement is to some extent corroborated by detailed statement made to Mr. Hammer, assistant engineer, at the time the inspection took place. This detail is found attached to the testimony of Mr. Crane. There is also a letter from Mr. Crane, dated April 22, 1911, found in the report of Mr. Goldmark, page 179, General Exhibit No. 1, volume No. 1, which gives a pretty complete detail as to the condition of material when inspected by Mr. Crane.

It will be noted that Mr. Crane's knowledge of the condition of the material was gained subsequently to the time it was determined to punch the holes smaller and subsequent to the time it was determined to use steel templates; but as at that time the larger part of the work on contract 4845 had been fabricated, it is merely a question on the part of Mr. Crane of checking it up to take care of any errors in connection with the fabrication of the material.

Mr. Conley, general superintendent of the Rankin plant of the Contractor, was asked this question (page 9):

Q. Were you familiar with the character of inspection that was being given that material as it passed through the shop by the Isthmian Canal Commission's inspectors?—A. Yes, sir.

Q. Were you sufficiently well acquainted with this work and the character of the various fabricated members of the work, to compare it with other work that went through the shop of the McClintic-Marshall Construction Co.?—A. Yes, sir; I think I was.

Q. How did this work, in the general requirements as to the accuracy with which it should be manufactured and the difficulties in manufacturing it, compare with first-class bridge work or other structural work?—A. In my opinion it was about two or three times better than any first-class bridge work I had ever seen going through.

Q. Well, it would be more difficult to manufacture, then, would it not?—A. It certainly would.

Q. Would it require any more detailed and accurate inspection to insure its being manufactured properly than would first-class bridge or structural work?—A. It should not have required any more inspection; the only thing was that the inspection was more severe.

Q. Do you mean that the inspection of the Isthmian Canal Commission's inspections was more severe?—A. It was more severe than first-class bridge work.

Q. I find on page 15 of this claim of the Contractor this statement: "That the Commission's engineers and inspectors demanded and received shop work of a much more refined and costly character than that called for by the contract." Do you know whether that statement accurately characterizes the requirements that were being made by the McClintic-Marshall Construction Co. under that contract or not?—A. I can not recall exactly the specifications on the contract. In fact, I do not remember of going into that very carefully. But I do know that the engineers and inspectors demanded work of a much finer grade than that used on any bridge specifications.



On pages 22, 23, and 24 in his testimony Mr. Conley states that the question of the substitution of steel templates for wooden templates in order to get more accurate work was discussed with him. He was asked this question:

Q. Do you think that (meaning change from wooden templates to steel templates) was necessary in order to get accurate work, or work of the accuracy required in this contract?—A. Well, from my experience I figure that that work could have been just as well done on wood templates as it was done on steel templates. The change was made by the engineering department, I believe; but I am speaking from my experience on other classes of work that had gone through that had been matched up and was done correctly—for instance, the Beaver Bridge—where the work was done on a wood template, and the work came together all right; I had nothing to do with the changing from wood to steel.

Q. Do you not think that the extra expense of providing the steel templates in work of that kind was more than compensated for by the greater accuracy obtained and the greater ease with which it would go together in the field? Do you not think, upon the issue of expense, that that would have been cheaper really, in the long run, to make and use those steel templates, than it would to use wooden templates?—A. No; I think the wood template would have been all right.

Q. You think the wooden template would have been all right; but do you not think the steel templates would have given greater accuracy?—A. I can not figure out why they would. If you will let me, I would like to explain that to you.

Q. All right.—A. The wood template and the steel template are the same when you start off. In other words, you make a mark across the wood template, and you do the same thing on the steel template. Now, that mark on the wood template is left to the judgment of that man with the carriage to stop the indicator directly over that mark on the wood template; the same thing applies on the steel template.

Now, you can make that mark on a wooden template, a brass template, a steel template, or any other kind, and still it is left to the judgment of the man operating the carriage to stop the indicator directly over that mark.

Now, you see the reason why a steel template would be preferred over a wood template was on account of the shrinkage or expansion of the material; wood has a tendency to shrink or elongate, as the case may be, according to the weather. Steel would not do that; steel would stay where it was originally built.

Mr. STERRETT. You would have the variations of temperature to contend with on the steel template.

Mr. CONLEY. Yes.

Mr. STERRETT. I mention this because I understand that they used thermometers at times on that work; so if they used thermometers, they must have taken account of the variations in temperature.

Mr. CONLEY. Let me go a little further than that, and say that you do not have to use either one; you can set a stop, and that is just as accurate as either one or the other, so far as the getting of good work in the material is concerned.

By Judge HARRAH:

Q. What do you mean by a "stop"?—A. A stop is a piece of steel that is set out along the rail on the table on which the carriage travels for conveying the material under the punch. These stops are set at predetermined points, at just where you want the hole to come in the material, you know.

Mr. Neeld, on page 12 of his testimony (Exhibit 23, vol. 23) stated that there was a great deal of discussion on unfair holes. He was asked this question:

Q. Did you take any steps to ascertain from your own measurements and your own inspection whether or not the number of unfair holes that were claimed to exist in the work was as great as the commission's inspectors insisted it was?—A. Yes, sir; I took a good deal of personal pains with that, to have them checked up, and many of them that they called an unfair hole I did not consider an unfair hole in that class of work.

Q. How did you differ with them as to what should be considered as an unfair hole?—A. Well, as the thing went along through the shop we did a great deal



of measuring and checking up, and, of course, there was always room for a difference of opinion on that—that such a thing would happen when the other thing took place, etc.—and if you should put a drift pin in it would change the whole situation. But the sum and substance of the thing is, as I remember, that we claimed that when we got the unit of the gate assembled the holes would clean up; we did not always claim they would clean up with a straight reamer, but according to the work that was specified there; but my recollection is that when we got the unit of the gate assembled according to the specification we took the whole gate, and my recollection is that there was not a hole that would not ream out when we took a small tapering reamer. It was possible for an inexperienced man to spoil a hole, but a man who knew his job would be able to clean up the hole. My recollection at this time—it was merely hearsay on my part at the time—but my recollection is that that worked out on the Isthmus.

Mr. Neeld's attention was then called to a letter from Mr. Wolfel to him, inclosing a letter from Mr. Hammer requesting him to check up and make a record of all holes for field rivets in the horizontal girders. Mr. Hammer's letter is quoted below:

In checking up location of holes for field rivets in horizontal girders I would advise that all such holes in the girders should be checked and records taken for each girder. In addition to checking the holes in the flange angles, it is believed necessary to also check up the location of the reamed holes in the girders for frame connections. Some of these last holes have been found inaccurately reamed—that is, the jigs have been moved to accommodate the punched holes. I would advise that the holes for the templets, which are to be used in checking girder angles, should be carefully checked.

It may also be found desirable to check up some of the other material; for, instance, sheathing and doubling plates.

Judge HARRAH (continuing). On February 15, 1911, Mr. Wolfel wrote a letter to C. M. Neeld. That letter will go in as Exhibit 6 of Mr. Neeld.

(The letter last referred to was marked "Exhibit No. 6, Neeld.")

Judge HARRAH (continuing). That letter is as follows:

"Attached please find four copies of Mr. Hammer's letter of February 14, in reference to the checking of the girders and other material for the 54-foot 8-inch gates, leaves of the I. C. C. lock gates, our contract 4845; also my answer to the same, dated February 15, and also four copies of Mr. Guynn's report to Mr. Hammer, dated February 10. We further send you four blue prints giving the results of Mr. Guynn's checking of 11 girders up to date.

"In discussing the checking of the jigged holes in the webs of girders, Mr. Hammer requested to have the checking templets made with holes one-fourth or one-half inch larger than the holes used in the girders and then have, from these templets, the holes marked off on the girders with paint, similar to what we discussed in the city office last Friday for the cover-plate templets. Please advise whether you can arrange for this."

The report of Mr. Guynn to Mr. Hammer, dated February 10, 1911, referred to in that letter will be made an exhibit.

(The letter last referred to was marked "Exhibit No. 7, Neeld.")

Judge HARRAH (continuing). On February 15, 1911, Mr. Wolfel wrote a letter to Mr. Hammer, which will be made an exhibit.

(The letter last referred to was marked "Exhibit No. 8, Neeld.")

Judge HARRAH (continuing). That letter is as follows:

"This acknowledges your letter of February 14, asking us to check over all field holes in the girders fabricated up to date, in the flanges as well as in the web. We will be governed accordingly. We will also carefully check the templets which will be used for this purpose.

"The matter of checking up the other material, like sheathing and doubling plates, we will take up later on, if it is found desirable or necessary."

Mr. Neeld was asked this question:

Can you give me more in detail than is shown in these letters the reason for that procedure as outlined in these letters?—A. Now, that is after we had the leaf assembled?



Mr. Neeld's attention was called to a letter from Mr. Guynn of February 15, 1911, which was made Exhibit No. 9 of Mr. Neeld's testimony, in which Mr. Guynn stated that the work was generally satisfactory. In reply to this letter Mr. Neeld stated:

Yes; generally. That is just where the trouble was, that "generally." We could not work on that basis. There were the girders lying there, and they would not say what was acceptable and what not. We had demonstrated to our satisfaction, by assembling, that the work ought to be considered satisfactory.

Mr. Neeld was then asked this question (p. 21):

Q. After that check was made, Mr. Neeld, what change, if any, was made as to the manner of fabricating the work?—A. Well, they seemed to demand absolutely perfect holes; and the only way we saw to get them was to make steel templets, which we proceeded to do; and the size of the holes was reduced; I think it was about that time, judging from the letters.

Mr. Neeld was then asked this question:

Q. Mr. Neeld, did you ever discuss the question of the advisability of punching smaller holes than were required in the specifications with either Mr. Hammer or the representatives of the McClintic-Marshall Construction Co.?—A. Why, I do not have a specific recollection of the exact conferences or the times at which that was discussed; but it probably came up when we were out in the yard there discussing that whole section of leaf—the first one that we assembled—and that the Government representatives there, including Mr. Hammer, said that that work was not satisfactory, and would not be satisfactory the way it was.

Well, it was reasonably close, being as close as could be expected under the specifications; and I know by his letter here [indicating], of the 23d, that he practically threatens us that unless things are different he would reject the work, and he then goes on to say that he would advise punching the small holes.

Q. Well, do you know what you said about punching small holes about that time?—A. I do not remember.

Q. Did you discuss it with Mr. Hammer?—A. Well, I do not remember the details of that discussion, but I am satisfied that we talked it over there; I am satisfied that I never agreed to punch small holes, knowing the difficulty of fitting it up.

Q. Had the difficulty of fitting it up occurred to you at that time?—A. Undoubtedly it had, because I know from my all-around shop experience that the difficulty of fitting up with small bolts is a serious matter.

Q. Do you know whether you ever called the attention of the management of the Rankin shop to the difficulty of fitting up with small bolts?—A. I was the management of the Rankin shop.

Q. Well, I mean those over you.—A. Do you mean Mr. McClintic?

Q. I mean Mr. McClintic or any of those over you.—A. I do not remember that I did. I might have taken it for granted that they knew.

Q. After the change was made, did you have any difficulty in connecting with the holes in the way they were matching up? Did you have any difficulty?—A. I do not remember. Judge. Possibly I might have left before we did very much fitting up after that.

Q. Do you remember, Mr. Sterrett?—A. You left June 1.

In Mr. Paul Wolfel's testimony, General Exhibit No. 7, volume No. 7, pages 205 and 206, a letter from Mr. Hammer, dated January 21, 1911, is introduced which obtains the first suggestion in writing that it would be necessary to reduce the size of the holes. This letter is Exhibit No. 61 in Wolfel's testimony above referred to, and reads as follows:

Inclosed please find copy of letter of this date from Inspector George F. Guynn to myself showing results of inspection of a number of girders. From Mr. Guynn's report it will be seen that the number of unfair holes is abnormally large, and I would recommend that steps be taken immediately to reduce the number of unfair holes. As the conditions in this respect have not been



improved, it is believed that it will be necessary to reduce the size of the punched holes or to drill holes from templates.

During erection of the first leaf, it will be shown also whether it will be necessary to ream holes for connections between vertical frames and girders in the field, as you will realize it is important to get these holes to match, and, at the same time, have the flanges of the frames and girders lined up perfectly.

Mr. Wolfel makes the following explanation as to his understanding of the meaning of this letter and to what subsequently took place in connection with the punching of small holes (see p. 206):

When I saw this letter first, I thought it referred to the holes in the skin; but later on, from Mr. Guynn's report, I found it refers to the holes in the webs of the girders which were reamed, and through which rivets were driven in the shop. But this is the first intimation that the idea of using small holes had entered into Mr. Hammer's head.

Now, this letter clearly shows that this took place before the leaf had been assembled, because it says, "During the erection of the first leaf it will be shown," etc.

The testimony of Mr. Wolfel and others in connection with the subject of changing the size of the holes is quoted below for easy reference:

(Page 207:)

Mr. GOLDMARK. I think that is clear. [Referring to above quoted statement made by Mr. Wolfel.]

Mr. WOLFEL. Meanwhile, as shown in Mr. Guynn's report of March 1 to Mr. Hammer, a copy of which is on file, starting January 28, 1911, the shop began to assemble the lower part of the leaf in the yard, and this continued until February 15, 1911, on which date, as Mr. Guynn states, the contractor stopped erection on these leaves. That is the time when Mr. Hammer got so excited about the mismatching of the holes.

Now, it happened that during that period some slight change was made in the wedges of the 54-foot 8-inch leaves; and under date of February 22, 1911, Mr. Pendergrass wrote to Mr. Hammer a letter which I herewith submit:

We hand you herewith two prints of sheets Nos. 126 and 127, details of wedges under end reaction castings for the 54-foot 8-inch gates.

Judge HARRAH. In order that the record may be clear, I do not think we have yet shown what connection Mr. Pendergrass has with your company, and I think we had better put that in the record.

Mr. WOLFEL. Yes. I believe at that time Mr. Pendergrass's title was chief draftsman. Since then he has been made engineer of the Rankin plant. He had charge of all the drawing work at Rankin, and the man in charge of the lock-gate work drawings reported to him. He handled all correspondence with Mr. Hammer about detailed drawings for the lock gates.

Judge HARRAH. All right, that makes the record clear.

(Page 208:)

Mr. WOLFEL (reading). "We hand you herewith two prints of sheets Nos. 126 and 127, details of wedges under end reaction castings for the 54-foot 8-inch gates. These two sheets have previously been approved by you, but we have been compelled to make them over again owing to the new arrangement of the wedges, with which you are familiar. We also hand you the original tracings of these two sheets in order that you may compare the two. We would thank you to approve these two sheets at your earliest convenience."

Now, this is purely a letter submitting drawings for approval. Nothing is said about trouble with the leaves; nothing is said about the use of small holes.

Q. When was that letter written?—A. February 22, 1911.

(The letter last referred to was made Exhibit 63, Wolfel.)

Mr. WOLFEL (continuing). Now, Mr. Hammer replies to that under date of February 23, 1911—letter to Mr. Pendergrass:

"Referring to your letter of the 22d instant, in regard to approval of sheets Nos. 126 and 127, showing details of wedges under end reaction castings for the 54-foot 8-inch gates:

"The blue prints received seem to be correct, and the tracings for same, submitted this date, have been approved, and are returned herewith. The old tracings are also returned herewith, and should be marked void."

So far it is purely a routine matter. Now, next he says:

"In case all the 54-foot 8-inch leaves should be assembled here and match marked, it may prove necessary to have also these wedge plates match marked, as otherwise a number of holes would not ream out clean and the work might be rejected.

"I would advise punching smaller holes. Respectfully, J. Hammer."

First, the third paragraph shows that in Mr. Hammer's mind had arisen the possibility of—

Judge HARRAH (interposing). Well, I do not care about your arguing about what it showed in Mr. Hammer's mind. What did it show to you?

Mr. WOLFEL. Well, when I saw it—I had not seen it at that time; but when I saw it in the records it showed to me, first, that in Mr. Hammer's mind had arisen the idea that it might be necessary to assemble all of those 54-foot 8-inch leaves in our yard and match mark them.

Mr. GOLDMARK. All the eight?

Mr. WOLFEL. Yes; all the 54-foot 8-inch leaves. That shows how alarmed he was about the small holes; that shows how impractical he was to think of such a thing. It would have taken us a year and a half to do it.

By Judge HARRAH:

Q. Was this letter brought to your attention at the time it was written?—A. No. I had no hand in this controversy about small holes, and what Mr. Hammer claimed was bad work in the shop. I talked with Mr. Hammer, and knew he was alarmed about it, and knew that he was unduly alarmed about it. But this matter was handled between the management, by which I mean Mr. McClintic and Mr. Marshall and Mr. Hammer, and all I can tell you is from the correspondence as the result of this letter.

Now, what happened there on that day I do not know. But here is a letter from Mr. Pendergrass to Mr. Froesell, who (p. 210) was in charge of the drawings, dated February 23, 1911, as follows:

"Please see that the following work is done at your earliest opportunity, and when completed return this order to the undersigned.

"It has been decided that for the first leaf of the 77-foot gates to punch all the holes in the skin and the pieces which connect to them  $\frac{1}{8}$ -inch, both for  $\frac{3}{4}$ -inch and 1-inch rivets. Do not, however, change the tracings, but note on the prints in the shop in yellow pencil, as it may be necessary to change this later on."

(The letter last referred to was marked "Exhibit 65, Wolfel.")

Mr. WOLFEL (continuing). That was the direct outcome of this correspondence.

It will be noted, however, I ought to add, that this note covers only one leaf. Now, there must be something else later on which will apply to all, but that I have not been able to find.

Q. Have you the reply of your office to this letter of Mr. Hammer of February 23, 1911?—A. This is all the correspondence I have been able to locate; and, as I said, I did not see this correspondence at the time being myself. I only ran across it lately.

Q. You do not know, then, whether there was ever any reply made to that letter of Mr. Hammer?—A. I have not been able to find one, and I judge that the transaction was verbal after that.

Q. Was the subject of changing the size of the holes (p. 211) brought to your attention at the time Mr. Pendergrass gave instructions to Mr. Froesell to make the change?—A. I do not believe so, and I know I had nothing to do with reaching any decision in this matter; it was entirely handled between our management and our drawing room. But I want to say this, that of course I heard later on about the use of these small holes, and I want to state this, that I have always been strongly opposed to their use. As I stated, my object in using the 1-inch rivets was to get the benefit of the large holes, and I made pencil sketches myself showing how wasted the use of these small holes was. I have not the pencil sketches.

(Page 211:)

Q. When did you first learn small holes were being punched or drilled in this material?—A. It must have been just about that time. I could not give



a definite date when I heard first, but I probably heard shortly after this occurrence.

Q. Well, if you were opposed to the use of small holes and thought it was a detriment to the work, what action did you take to prevent it?—A. That is what I was leading up to. I prepared myself pencil drawings, which are not any more available, but of which I have made a reproduction here in ink; and I have been over those pencil drawings with Mr. Hammer and Mr. McClintic and Mr. Marshall to try to prove how senseless it was to use those small holes; and I can explain that sketch to you and Mr. Goldmark right here.

Q. Comment on and explain the sketch you have submitted showing the finished diameter of holes for 1-inch rivets (p. 212) and the relative position of eleven-sixteenths-inch punched holes in the same.

(The sketch was marked "Exhibit 66, Wolfel.")

A. Figure 1 on the sketch shows the final reamed-out hole,  $1\frac{1}{8}$ -inch diameter, and two badly punched holes eleven-sixteenths-inch diameter, which are so badly punched that the hole will just about clean up. This would be an extreme case in favor of the argument of using the eleven-sixteenths-inch holes.

Mr. GOLDMARK. Yes.

Mr. WOLFEL. In that case the overlap of those holes would only be five-sixteenths inch; and how in the world could five-eighths-inch bolts be gotten through there?

Figure 2 shows what, in good practice, we aimed for, to have the holes clean up all around; I assume one-sixteenth inch; it shows the hole  $1\frac{1}{8}$ -inch diameter in the final finished work and two eleven-sixteenths-inch holes which have a common diameter of fifteen-sixteenths-inch holes, making a fifteen-sixteenths-inch appearance all around. Even there the overlap is only eleven-sixteenths inch, and five-eighths-inch bolts were out of the question.

Now, I have discussed the thing with Mr. Hammer on several occasions; and Mr. Hammer has never told me that he wanted the small holes used, but the only answer I have been able to get from Mr. Hammer was (p. 212) that he might take it up with the Isthmus—the question of going back to the larger holes.

And there I dropped it, because he did it in a cool and reluctant way; and I did not know whether he would recommend the acceptance or rejection of my request. I did the same way with Mr. McClintic and Mr. Marshall, but I never was able to have them take action so that we should go back to (p. 213) larger holes. Why, I guess they could explain themselves best.

Mr. GOLDMARK. Mr. Wolfel, assuming that in the eleven-sixteenths-inch holes the diameter was a proper diameter for a seven-eighths-inch rivet, why was it also adopted for the 1-inch rivet, where it evidently is a much more excessive reduction in size? The two do not work together.

Mr. WOLFEL. You just hit the nail on the head. It is the same argument I was using all the time; and here is the correspondence sketch for seven-eighths-inch rivets with an eleven-sixteenths-inch hole; and I stated to Mr. Hammer and Mr. Marshall, "Now, if you want eleven-sixteenths-inch holes for seven-eighths-inch rivets, what is the use of insisting upon eleven-sixteenths-inch holes for 1-inch rivets, when the conditions——"

Judge HARRAH (interposing). Wait a minute. That will be Exhibit 67.

(The sketch last referred to was marked "Exhibit 67, Wolfel.")

Mr. WOLFEL (continuing). "When the condition in the 1-inch rivets is entirely different from the condition on the seven-eighths-inch rivets?" Exhibit 67 is the corresponding drawing for a seven-eighths-inch rivet.

Mr. MARSHALL. When this matter first came up with Mr. Wolfel and ourselves Mr. Wolfel realized that the success of that work would largely depend upon the ability to bolt it up tightly; he time and time again forced that opinion on all of us; and that was one of his reasons for favoring the 1-inch holes, so that we could get seven-eighths-inch bolts. He also pointed out to us time and time again the foolishness of (p. 214) punching these small holes; and the work on the Isthmus demonstrated the fact that he was correct in the statement that it would be practically impossible to bolt that work up with five-eighths-inch bolts tight enough to drive proper rivets.

I afterwards—I think it was on my first trip to the Isthmus—took up with Mr. Goldmark this matter of punching the small holes, and he (p. 214) agreed with me that it seemed to be foolish; and after discussing the matter he cabled to Mr. Hammer, telling him to allow us to punch the larger sized holes; and



I at the same time cabled to Rankin. We started out to punch the larger holes on the next contract; but the work had proceeded only a short distance—I think the first contract—until we were ordered to change them back to the small hole.

Mr. WOLFEL. Pardon me; I do not believe you can quite say we were ordered to change them back to the small holes, but we were requested to change them back to the small holes; we were not ordered; we were only requested or advised. I have the correspondence here. I would make it a little milder.

Judge HARRAH. Mr. Marshall, this direction from Mr. Pendergrass is dated February 23, 1911. Now, if Mr. Wolfel had called your attention to this matter immediately thereafter, and insisted that it would be essential to good work and easy bolting up, and easy erection on the Isthmus, to have these holes as originally specified in the specification, and as provided for in the modifications to the specifications, why was it that you failed to take this matter up in an official way with Mr. Goldmark or others in authority (p. 215) until you went to the Isthmus?

Mr. MARSHALL. I think the matter was left entirely in Mr. Hammer's hands, and I think it was entirely due to Mr. Hammer's instructions.

Judge HARRAH. You do not seem to get my question: Why did you neglect to take it up after being advised of the seriousness of having to punch these small holes from February, 1911, until about December, 1911?

Mr. MARSHALL. We were continually taking it up with Mr. Hammer.

Judge HARRAH. You were taking it up with Mr. Hammer?

Mr. MARSHALL. We were taking it up with Mr. Hammer continually.

Judge HARRAH. Verbally?

Mr. MARSHALL. Verbally and otherwise. Of course, after we had decided to go ahead and punch the small holes, the matter rested until later on.

Judge HARRAH. I do not think you have fully answered my question yet, as to why you did not take it up with Mr. Goldmark before that.

Mr. MARSHALL. I do not know why we did not take it up.

Judge HARRAH. Had you had any complaints from Mr. Jewel?

Mr. MARSHALL. Yes; is not there correspondence with Mr. Jewel?

Mr. WOLFEL. Yes; there is correspondence with Mr. Jewel.

Mr. MARSHALL. Mr. Goldmark, do you remember whether Mr. Jewel had taken it up with you.

Mr. GOLDMARK. Oh, yes, Mr. Jewel had taken it up with me; I mean he had objected to the small holes. I do not know just when, but a number of times he had said that those small holes were a very great detriment to his work. But not in writing; never in writing.

Judge HARRAH. If you were satisfied that the small holes were damaging you and making the work of erection, including the bolting up and the riveting and everything else, much more expensive, what was your special reason for not going further than Mr. Hammer and trying to get relieved from that situation?

Mr. MARSHALL. Well, I think we had pretty near reached the point where we were convinced that we could not get any relief from Mr. Hammer, and that we could not go over Mr. Hammer's head. I came here to see Capt. Boggs. He told me we had to take it up with the Isthmus, and whenever any question came up between Mr. Hammer and ourselves, and it was referred to the Isthmus—in regard to the drawings, the inspection, or otherwise—it was always referred back to Mr. Hammer.

Mr. WOLFEL. Can I say one word here? Now, I did not want to give you the impression that the seriousness of that matter drawnd on me as soon as I heard the first time about the small holes. I never liked the idea, but, like all our engineering matters, by and by they grow on your mind. It probably took me three or four months before I realized what the thing meant; and that is the time I got busy and made those sketches. It is pretty hard to see everything at once; at least, my mind is not built that way; I am not perfect.

Mr. GOLDMARK. Mr. Wolfel, for these 1-inch rivets, you realize that if you had punched seven-eighths-inch holes, according to the specifications, you could not have used anything larger than seven-eighths-inch bolts, do you not (p. 217)?

Mr. WOLFEL. No; the seventh-eighths-inch rivets you had in the light stuff; on the upstream side above the air chamber, and on the downstream side it was all light stuff. But when you came to the upstream side in the air chamber, where you had thick metal, four thicknesses of 1-inch metal, you had to have something better.



Judge HARRAH. The 1-inch metal in four thicknesses, you had a modification allowing you to use 1-inch rivets?

Mr. WOLFEL. Yes; 1 inch. I was as sorry as I could be. I after everybody——

Mr. GOLDMARK (interposing). There were not four thicknesses of 1 inch. One is 1 inch and one is three-fourths inch; but there were four thicknesses.

Judge HARRAH. One thickness of 1-inch stuff?

Mr. GOLDMARK. Yes, sir; the others are a little less than 1 inch.

Judge HARRAH. The four thicknesses were all rather heavy material?

Mr. GOLDMARK. Undoubtedly, in some places.

Judge HARRAH. And that would have to be drawn together close enough so as to prevent the chipping from the reams getting between the plates?

Mr. WOLFEL. Before they could draw together, in quite a large number of cases—Mr. Sterrett can tell you that (p. 218)—they simply “busted” the bolts; they put big wrenches on the bolts and broke them; they could not draw it together.

Mr. GOLDMARK. That is true.

Mr. WOLFEL. Now, what always impressed itself upon me so futile in the transaction was that if that work was so bad that we ought to use the eleven-sixteenths-inch holes, you could not have done anything in the field, because you could not have bolted up the eleven-sixteenths-inch holes.

Mr. GOLDMARK. No; if you could use five-eighths-inch bolts in the eleven-sixteenths-inch holes, the work was all right.

Mr. WOLFEL. That is what I was coming to. Mr. Dumville and Mr. Bellringer enlarge upon our applying the five-eighths-inch bolts in the eleven-sixteenths-inch holes.

Mr. GOLDMARK. That has never been doubted.

Judge HARRAH. On February 23, when this change appears to have been suggested by Mr. Hammer and directed by Mr. Pendergrass, had you erected any part of the 54-foot 8-inch leaves?

Mr. WOLFEL. Well, this is covered by what I stated before, that in Mr. Guynn's report of March 1 to Mr. Hammer he states that “on January 28, 1911, we started to erect the first section of that leaf, and stopped work on February 15, on the erection of it.”

Q. Were you present at the time they were doing that erecting work there?—A. I was present off and on, and I recollect Mr. Hammer was very much alarmed about how the holes came.

Q. The apparent reason for which appears to have been the failure of the holes to match up?—A. As perfectly as Mr. Hammer wished it (p. 219).

Q. That seems to be the basis of it?—A. That is the basis of the whole trouble.

Mr. GOLDMARK. Both in the regular shopwork and in the erection.

By Judge HARRAH:

Q. That condition had been developed in the shop before any of that correspondence took place?—A. Which correspondence do you refer to?

Q. I refer to those letters of February 23, 1911, Mr. Hammer's letter in which he suggests that they use the small holes, and Mr. Pendergrass's letter which you introduced saying the small holes would be used.—A. Yes; because the work was stopped February 15.

Mr. STERRETT. In the testimony taken on the Isthmus, Mr. Dumville, who was chief inspector for the Commission at Gatun, was testifying, and in his direct examination I asked him this question:

“Q. What would you say from your experience with lock-gate work; do you think the small holes were justified? Do you think it was necessary to punch the material small in order to get satisfactory work (p. 219), as called for in the specifications? That is, could the work have been successfully done using a larger hole?—A. Yes. I think it could; I am sure it could.”

Under his cross-examination, Mr. Rousseau said to him:

“I want to know the maximum size bolts that the contractor had or could have used, even if this material had not been punched three-fourths and seven-eighths inch.—A. I believe that, owing to the accuracy with which (p. 220) the shopwork was done in this job, it was possible to erect the lock gates with full-sized holes and not get any very bad results.”

That is, punch the hole one-sixteenth inch larger than the rivet. That is the way they do on ship work.

Judge HARRAH. I do not think that is exactly material, because you certainly would not claim that you had the right to punch the holes any larger than as called for in the original specifications.

Mr. STERRETT. I just bring that in to show the accuracy of the shopwork.

Mr. WOLFEL. We have more testimony on that.

Judge HARRAH. On what?

Mr. WOLFEL. On the good fitting of the holes in the field.

Judge HARRAH. That was all gone over on the Isthmus.

Mr. WOLFEL. Except that it is likely to be overlooked in a great mass of testimony; and if you put in a few statements here about the work on the Isthmus, about how close the work fitted, it would show clearly to everybody that this use of the small holes was not called for, and it is especially material——

Judge HARRAH (interposing). I hardly think it is necessary to repeat that in the record here, as to what was testified to down there. Now, if you know anything about the matter and how the erection work was going up from being down there and seeing it, I would be very glad to have you state that.

Mr. WOLFEL. I will not testify about that, because (p. 221) others know better about it.

It will be noted that this testimony was given in the presence of Mr. Henry Goldmark, and it will be noted also that it contains an explanation by Mr. Marshall, president of the McClintic-Marshall Construction Co., giving the reasons why a change was made to the small holes.

Attention is also called to the statement made by Mr. Wolfel (see next to last paragraph on p. 100 of this report) to the effect that he did not at first appreciate the seriousness of the small holes.

Mr. Wolfel's testimony, therefore, must be viewed in the light of this explanation. The sketches which he made and which appear as exhibits 66 and 67 to illustrate the effects of the small holes must be considered as having been made subsequent to the time that it was determined to punch the small holes.

The above testimony shows pretty clearly that Mr. Hammer thought it was necessary to reduce the size of the holes in order that the holes might clean up when reamed out. It also shows that Mr. Hammer first suggested the use of small holes in order to secure the accuracy in the work that he was demanding. It also shows that the McClintic-Marshall Construction Co. understood that it would be necessary for them to reduce the size of the holes in order that they might be reasonably certain of meeting the demands being made upon them by Mr. Hammer as to the accuracy with which the holes should be spaced. In connection with the accuracy demanded by Mr. Hammer, attention is invited to the testimony of Mr. John Ostrom heretofore quoted.

In connection with the examination of Mr. Crane, Mr. Wolfel explains what preparations were made in order to properly fabricate this material and gives some of the reasons why they had difficulty with the work in the beginning. The statement of Mr. Wolfel, together with the statement of Mr. Crane in response to his questions is, for easy reference, quoted below (p. 120, General Examination No. 5, vol. No. 5):

Mr. WOLFEL. Now, Mr. Crane, you have stated that the work on the lock gates was not as good as work our company had done for you previously, and after the contract of the lock gates was taken in hand and went through?—A. Yes.

Q. You have also referred there to the Pennsylvania Tunnel and terminal work and to the Hell Gate bridge work?—A. Yes.

Q. You have also given as a plausible explanation of that—well, to make it suit your ideas, poor workmanship—the fact that the contractor was a low-priced contract, and that the work was trying to be gotten out as economically as possible?—A. Yes.



Q. Those statements are in accordance with the facts there?—A. Yes.

Q. All right; you are familiar with all our plants previous to the lock-gate contract?—A. Yes, sir.

Q. Did you ever work at the Carnegie plant?—A. I worked at the American Bridge Co.

Q. At our Carnegie plant?—A. At your Carnegie plant? No; I am not familiar with it.

Q. Are you familiar with the Pottstown shops in 1910?—A. Yes.

Q. Of our shops at Rankin previous to 1910?—A. Yes, sir.

Q. From your knowledge of these shops, are you willing to admit that our shop No. 2 is the best equipped shop we have?—A. Yes; I think No. 2 is the best equipped shop; yes.

Q. I suppose you are aware of the fact that the shop No. 2, immediately previous to the lock-gate contract, has turned out some of the most important work, like the Winner Bridge, of Kansas City, of 18,000 tons, and the Beaver Bridge, at Pittsburgh, and Lake Erie, of 17,000 tons; that this work was of such a character that it not only was of national but of world-wide importance? You know the Beaver Bridge was probably for months in the Engineering Record and Engineering News, and in London Engineering, in German and French papers?—A. Yes.

Q. And everybody commented on that work as being of the highest character?—A. Yes.

Q. Now, you realize that the same men that did build those bridges were put on the lock gates? You understand that?—A. Yes; I understand that.

Q. You understand that the same equipment that was available for those bridges was put on the lock gates?—A. Yes.

Q. You realize that after the lock-gate contract was taken, and before a stroke of work was done, the equipment that had previously done all this fine work was radically changed by adding pickling plants, sand blasts, by buying some of the best planers that money could buy, by installing those American milling machines with the fine adjustment, where every degree of temperature could be taken care of by the installment of a smoothing plant?—A. Yes.

Q. By every tool in that shop being overhauled so it could work with the utmost precision?—A. Yes.

Q. From memory, we spent between seventy-six and seven thousand dollars to improve that shop, to be ready for the markets. Now, furthermore, you are familiar with the supplementary agreement of August 8, 1910?—A. Yes.

Q. There are about 36 counts in there, and after going over 12 counts on page 15 of the supplementary (p. 123) agreement—let me say one thing first, here. I want to add that all these 36 changes were practically all made at my request, with the exception of one or two, like the doubling plates, which were made by Mr. Goldmark, as he thought his plans were efficient. Now, after going over those changes, I have worked in this supplement or appendix that says all these changes were made for the benefit of the work, at large expenditure—as far as we can figure, amounting to \$150,000 to \$180,000. Now, this figure at that time was only a guess, based on my judgment, but since then our engineer at Rankin made careful assessments of that, and I find, if anything, I was low. Of course, I want to state that while this was extra expenses, he did or did expect to get some things.

Judge HARRAH, What is the object of that?

Mr. WOLFEL. I want to see whether Mr. Crane is justified in making the statement that that is caused by our trying—having taken the work low and trying to economize in the work. I want to show that we went to any amount of expenditure to do the work first class. Now, with all that before you, do you still feel like maintaining that your statement was correct.—A. I do, most positively; yes, sir.

Q. You do? Then I have nothing more to say about this. You stated about the causes of the trouble in the work. There are some things that I have noticed you have not mentioned (p. 124). Do you realize, when you compare that work with the tunnel and terminal work and with the Hell Gate work, you realize that the lock-gate work was a work as important? Austin points out they had to work for three dimensions in bridge work. The work on girders is to one dimension; in the other work to two dimensions. Here is a class of work that had to be exact as to length, width, and height. It is a difficult thing to obtain.

Judge HARRAH. You are talking about the lock-gate work?



Mr. WOLFEL. The lock-gate work. You have the same condition as to shop-work, only there you do not have to maintain the same conditions. Here it had to be maintained. Do you not think that in this one condition alone is a much more reasonable reason for the difficulty in that work than in that broad statement that you made—that the work was troublesome because we tried to economize?

Mr. CRANE. No; we all admit that it was work peculiar in itself and very different.

Mr. WOLFEL. Is it not that one cause of the trouble there, a cause that never entered into your tunnel work and in your Hell Gate work?

A. It might with the work that we had with you, but it was not with the other.

Q. Are you referring to our work?—A. I am referring to your work; yes, sir.

Q. Furthermore, as I look at the work, one of the things that caused us most trouble was to get the work correct at the ends of the girders—of the leafs. There you had those sharp curves of thicknesses, three or four times as thick, some as large as 1 inch, and to get those holes right did require the utmost precision and care and was the most difficult thing in the whole work.

Mr. CRANE. Yes.

Q. Did you have anything of this nature on the work that you referred to—in the tunnel and terminal and Hell Gate work?—A. No; we did not have any of that accurate work.

Q. Do you not think in this other instance there is a more important cause than the broad statement you made about our trying to cheapen the work?—A. No; the idea is this: When you had that, when you started on that work, I think you are frank to admit that you did not appreciate the difficulties of it.

Mr. WOLFEL. We are prepared to show at Rankin, by instructions issued to all the shops that we all appreciate the importance and the difficulty and the close inspection this work would have. I can not take your word for that.

Mr. CRANE. Very well, then, if you appreciate that, what was the cause or reason that Mr. Guynn and Mr. Hammer held up all of that work?

Mr. WOLFEL. Because this was such an extremely difficult and different kind of work from any done before that anybody starting in at first on it was up against difficult problems, which, of course, might mean in the beginning slight deficiencies in the work.

Mr. CRANE. Yes.

Mr. WOLFEL. Now, this is a reasonable, fundamental reason of the difficulty, much better than what you have stated.

Mr. CRANE. Yes; further, did you not go on with that work after experimenting on it to find out, and that great quantity of work rushed through before Mr. Guynn or anyone started on the inspection of it?

Mr. WOLFEL. How could it be found out before we assembled the leaves? Why did not Mr. Hammer find it out? We went ahead in the best of faith.

Mr. CRANE. I know we could when I got on the work. I had to judge with the work before me.

Mr. WOLFEL. I know, Mr. Crane, but those main reasons you have passed by, and did you not know about those, and you say the work was bad because we bid low and tried to economize?

Mr. CRANE. That is our place.

Mr. WOLFEL. Certainly it is your business. Any shop would do that, but that should be no explanation (p. 127) of the difficulties, or reflection, when those other difficulties are so broad and so clear in everybody's mind.

Mr. Goldmark asked permission to correct some of the statements that had been made in his report, General Exhibit 1, volume 1. The corrections made are shown in the testimony quoted below (p. 14):

On page 65 of my report it says, at the second paragraph from the top:

“As a matter of fact, the matter had been taken up by Mr. Hammer with the contractors before my arrival.”

I will explain that that refers to the fitting of certain rivet holes.

“The method of doing the shopwork had been gone over thoroughly and work had almost stopped for two to three weeks on that account. I believe I was informed at the time that the contractors had decided to punch the holes eleven-sixteenths inch for all rivets and to use steel instead of wooden templets. I never understood that Mr. Hammer or any of our inspectors ordered these changes, and I understood that the contractors had adopted them of their own accord to get better work. I find nothing on the subject in the correspondence.”

While that statement is, I believe, entirely correct as it stands, I would probably not have written it quite as strongly if I had seen the correspondence with



Mr. Hammer, in which he suggests the holes being punched smaller, in his letter of February 23, 1911.

Q. Is that as far as you want to go in changing that?—A. Yes, sir. I see nothing in that that is not correct; I did understand just what I said there. I should like to say that the matter was a verbal statement to me from Mr. Hammer that these changes had been made; and the impression I got from Mr. Hammer was that it was a voluntary change by the contractors; but Mr. Hammer is sometimes a little hard to understand, and I now feel that that conclusion that they adopted it voluntarily is too strongly put; it may have been that Mr. Hammer ordered it; I do not know.

Q. Would you not think that it was more accurate, in view of the letter, to say that it may have been that Mr. Hammer suggested it, rather than ordered it?—A. Well, from that one letter, I think so; but, of course, he may have directed it verbally; I do not know.

Judge HARRAH. Do you want to ask any questions on that point, Mr. Wolfel?

Mr. WOLFEL. No, Judge; that is all right.

Mr. GOLDMARK. The next is in the middle of page 66. I do not suppose it is necessary to read that whole discussion.

Judge HARRAH. No. The middle paragraph or what?

Mr. GOLDMARK. No, sir. "Whatever the reason for adopting the eleven-sixteenths-inch holes," I think that paragraph is correct; and I do not want to change that next paragraph. But when you get to the top of page 67, in the middle of that paragraph—

Judge HARRAH. Please state just exactly the particular sentence to which you refer.

Mr. GOLDMARK. "I do not think the statement made by the contractors that this return to small holes was another unreasonable demand of the inspectors can be sustained. Mr. Price's evidence should be of value on this point. I never knew of any of the details on this subject."

Q. How do you want to change that?—A. And then the whole of the next paragraph, reading:

"I am inclined to think that the necessity of the small holes arises partly from the fact that the chord angles were bent cold, in a bulldizer, and that the irregular amount of stretching changed the position of the rivet holes, since they were punched before bending the angles. At any rate, experience seemed clearly to indicate that on these lock-gate girders good results could not be obtained with holes larger than eleven-sixteenths inch, even with careful shop work, at least for seven-eighths rivets."

I do not think that I had enough evidence that experience indicated that to make so positive a statement. I feel now that I do not yet know why those changes back to the eleven-sixteenths-inch holes were made in the shop, and I think my personal knowledge on the matter of returning to the smaller (p. 17) holes is not sufficient now and was not then to warrant so strong an expression of opinion.

This is the only correction that Mr. Goldmark made in his report with reference to the punching of the holes.

On pages 29, 30, and 31 of his testimony Mr. Goldmark gives his reasons for recommending Mr. Hammer's appointment.

By Judge HARRAH. Turn to to page 199 of your report. (It will be noted here that the letter of August 8, 1910, from Mr. Goldmark to Mr. Hammer is copied at page 199 of Mr. Goldmark's report.)

Did you give Mr. Hammer any verbal instructions as to the rules that were to be observed in making the inspection of this material and the general principles that were to be followed in interpreting the specifications?—A. I do not think so. Mr. Hammer had been engaged on the work in detail, made the greater part of the drawings, and had assisted me in getting up the specifications from October, 1907, until that time. He was fully familiar with every point involved, and I do not remember what I said to him in addition to turning over to him this letter and the agreement; we probably talked over some things, but I do not remember that at that time I said much to him.

Q. After some general statements bearing on the last paragraph of page 22 of the claim, which paragraph is followed on page 23 with what purports to be a report of the experience of Mr. Hammer, we find this statement:

"Mr. Goldmark, in his eagerness to obtain the very best for the commission, and with the quite natural pride a designing engineer takes in his work, also possibly on account of his knowledge of the inexperience of the assistant engineer put in charge, often, by word of mouth and in correspondence, stated that no other but perfect work would be accepted.



Did you make such statements as that to Mr. Hammer, either without the knowledge of the claimant or in the presence of representatives of the claimant?—A. I do not remember doing so. On the contrary, I remember accepting certain work that the inspectors had refused as not being perfect. I remember at least one occasion in which I told them that they were too severe and directed them to accept a rejected plate. I may have said so; I do not now remember the occasion.

Q. Would you have made such a statement to the assistant engineer on account of his known inexperience to you?—A. No, sir; I certainly would not have. I can not say that I would have.

Q. On page 20 of your report, under the head of "Claim 2-B," page 15, you state in relation to the shop experience of Mr. Hammer that:

"I was fully aware of this in recommending his appointment"—meaning that he had had no previous shop experience—"I felt satisfied, however, that he would give satisfaction in this position, and I feel now that no other man under the conditions could have possibly taken his place." On what information do you base that statement?—A. The first statement—"I felt satisfied"?

Q. Yes.—A. Well, I had had Mr. Hammer with me for several years, and a number of matters had come up outside of the lock gates, which I had discussed with him; and I felt sure that he was rather ingenious in mechanical matters. I think when he was with the New York Foundry Co., he had to get up some rather ingenious contrivances in connection with the air locks, and I got the impression, wrongly or rightly, that he was of a mechanical mind, which some engineers never are—never become. And I thought that he would fill the bill. And I also felt—I think that the next sentence is, perhaps, a little too strong—when I say that no other man under the conditions could have possibly taken his place, I mean that I say now on the Isthmus he could have filled it, and it would have been a mistake to bring in as the head man some entirely new person, possibly much more gifted than Mr. Hammer, who did not understand these particular plans; and I think it is also proper to say that at that time I fully expected to be in Pittsburgh with him for a considerable period of time; that I went so far as to almost engage a house in Pittsburgh for my family in order to be there during the succeeding winter, and help in the organization of these inspection plans; and that that was one of the reasons why Mr. Hammer was selected and why he was not given another assistant of high grade in the line of engineering work.

I did not go back to Pittsburgh, but was obliged to stay on the Isthmus; and after that the matter was left in Mr. Hammer's hands, and such assistance as he needed was given to him from time to time. I always regretted that I was not there during that formative period.

On page 32, Mr. Goldmark stated that he thought Mr. Hammer would be inclined to be more severe in inspection than he would. The questions and answers quoted below give Mr. Goldmark's opinion as to the action that was taken by Mr. Hammer in connection with the rivet holes in the first eight leaves:

Q. Did you find from personal experience with Mr. Hammer, in connection with the execution of this contract, that he was inclined, where a matter was left to his judgment as to what would be first-class workmanship, to make close decisions against the contractor?—A. I had little opportunity of observing that directly. I was only there once or twice, and I had to agree with him in his main contentions. I did ultimately relax the specifications somewhat in passing some of the material; but I can not say, in the main, things that he could very well, as far as I know—I do not know, that is, about it—have passed those things without question (sic).

Q. Can you give some specific instance to illustrate the point?—A. Well, only a question in which I think there was a great deal of trouble—that is, in connection with the fitting of the rivets, the rivet holes, in the first eight leaves. I happened to be in the country, and was asked to go out there and examine the leaves with Mr. Hammer and others, and they were not as good as they should be; and Mr. Hammer was (p. 33) puzzled as to what he had better do. He had shipped 66 of those girders, which he thought would pass, I never saw those. The girders, which were in the yard, we examined together, and it was rather hard to arrive at a conclusion. They certainly were not as good as they should have been; Mr. Hammer was much worried; but, I think, I would have felt just about the same as he did about those particular



girders. I can not say but what I had approval for what he had done in that matter at that time. I do not see that he could have done any other way.

It will be noted from this statement that Mr. Goldmark examined the girders which were in the yard with Mr. Hammer. It will also be noted that he stated:

"I think I would have felt just about the same as he did about those particular girders. I can not say but what I had approval of what he had done in that matter at that time. I do not see that he could have done any other way."

On page 33, Mr. Goldmark was asked this question:

Q. What was the condition of the organization when you were in Pittsburgh in May?—A. In March?

Q. In May; do you remember you went there?—A. I was there twice; once in April and once in May, I think; I have the dates here.

Why, it was by no means good. I was in the South here on my annual leave, and Maj. Boggs telegraphed me to come up here, and took me out to Pittsburgh with him, and, as I recollect, Col. Hodges. At the time the organization of the inspection force was not in good shape; there was discontent. The chief inspector had resigned, and complained of Mr. Hammer, and the inspectors were measuring and remeasuring, and I did not like their spirit toward the work altogether, or toward the Contractor; and I have no hesitation in saying that at that time something was wrong. I have always laid it to Mr. Hammer's being altogether overworked, and to these troubles that had come up in connection with the riveting. I think the men tried to do good work, the inspectors who were there, but evidently they were not well handled at that time. There was something wrong; there was more or less heedlessness; I was not pleased at all.

Q. How was that affecting the work of the Contractor at that time, if you were able to tell?—A. Well, at that time they had had that trouble with the rivets—with those rivet holes in the first eight leaves—and if I am not mistaken, I was told that they had practically done nothing for several weeks in the attempt to get up some method by which they could succeed in having those girders and additional girders passed. The inspectors were not properly led; the chief inspector did not seem to (p. 35) be the chief inspector. The work seemed to be done by individual inspectors, all of whom had a good deal to talk about and to say; and I do not know positively, but I do not doubt that that had a bad effect on the shop.

Q. Well, was there very much material that had been fabricated and was ready for inspection in the yards at the time that you were there?—A. Oh, yes; there was a good deal; but it was held for a decision largely on those first eight leaves, as the result of erecting one leaf. They could not ship it. Mr. Hammer had stretched his conscience a little, as it was, shipping 66 girders; and I never understood that, strictly speaking, according to the specifications, he should not have shipped those 66 girders; but I believe, so as I recollect it—I know there was a good deal of stuff piled up in the yard and a good deal had been measured, and remeasured and remeasured, and no decision had been arrived at by anybody; and ultimately more piled up; and it was several months before the matter was fully straightened up and the stuff shipped out.

Q. Well, in view of the conditions that you found there, that you have described, what steps did you take to remedy that condition?—A. Well, the first thing I did was to hire Mr. Price, as chief inspector, to go there and organize the force; and I also recommended an increase of the force, directly or indirectly, to Maj. Boggs, who had more or less to say about the appointment of men. And I also instructed Mr. Hammer, I think verbally, to leave that—perhaps not to leave that—but to use Mr. Price, and to have Price act as a true chief inspector; and I think I told Mr. Price that he was the man that I wanted to run that inspection, and to have the men divided over different parts of the work, each having his part, etc., which I think was done.

Q. Did you at that time give Mr. Hammer any instructions as to the principles that should be applied in the inspection?—A. Well, I do not remember exactly. But I think I told Mr. Hammer, not only then, but at other times, to be as reasonable as he could; that there were certain things that were very important, and in going over the matter with Mr. Hammer and Mr. Price—for instance, the A frames at the end—I told them that there was a place where they could not be too particular, hardly; and that there were other places where such very great accuracy was not necessary. Of course, I did not want to interfere in details; I was only up there by accident, so to speak, for a few days at a time; and I thought I had the matter in shape to get well in hand; and I think it was in hand after a certain amount of time, as they got



inspectors gradually. It was by no means easy to get authority for additional inspectors.

Q. Was your attention called to the fact that at that time the contractor was making steel templets to check up that work in the yards?—A. Oh, yes—well, I do not think that was to check up the work in the yard erected; I understood that they would use steel templets in all future work; that all plates and angles in originally laying them off in the shop they would use steel templets instead of wooden templets; and it may have been that they would also use them for checking up certain girders. You must not forget that the material in the yard—the only material that I know of—was the girders.

Now, in the girders a great many rivets are driven in the shop, and you can not do any more checking, and do not need any more checking; then there were certain holes reamed to size for connecting certain frames and diaphragms; then there were other holes in the angle flanges which connect to plates in the field, and were small holes; those were measured with tapes in my presence by our inspectors and the contractor's inspectors, by Mr. Hammer and by myself, and I think by Mr. McClintic; and no two hole measurements agreed. But still, it would seem that they were not quite correct. The steel templets I do not remember coming up exactly in that connection.

Q. You say no two measurements agreed. What would be the reason for that, if they had the same line and the same surface?—A. Well, they were 65 feet long, and the tape may have been a little different in temperature; and it was on a curved surface; and it was a peculiar fact that the contractor's measurement always seemed to be a little better than our measurements or the inspectors' measurements; and it was by no means easy to measure these things very closely.

Q. Well, would you attribute the fact that the contractor's measurements appeared to be better than your measurements to the fact that the contractor's inspectors were more experienced?—A. I do not know. I satisfied myself that it was not so awfully easy to measure every single rivet from a true center and be certain just where it was on that curved surface. I do not know. It is perfectly fair to say that I think in some cases our inspectors had some little personal feeling in the matter, and they were rather glad when they found things were out, and naturally the other man was glad that he was right. I gathered from all the conclusions in all the measurements, our measurements, my measurements there, and also very much from observing those same holes after they were erected in the gates that were up there, that a great many of those holes on the curved surfaces were not as good as they ought to be; and I was quite certain, I think, that they were not as good as they ought to be. And I say I have always known that there was a great deal of difference of opinion as to the measuring on those curved surfaces.

Q. During the time that you were there, or prior to that time, had any question arisen—or was it a question—as to the size of the holes that were to be punched—ever been mentioned to you?—A. Before I got there?

Q. Before you got there or while you were there?—A. It was not mentioned to me before I got there, but while I was there Mr. Hammer told me that it had been decided to punch the holes eleven-sixteenths of an inch, and I got the impression from him that it was the contractor's voluntary decision. I got that as a general impression that I have carried with me ever since, but I do not know that Mr. Hammer said so in so many words.

I would also say that at the time it never occurred to me that that small hole—eleven-sixteenths of an inch—would apply to those girders that connected to 1-inch sheathing plates—or, in other words, that it would apply for 1-inch rivets. And when the first girders came down to the Isthmus and I found that the 1-inch rivets had eleven-sixteenths of an inch holes, I was very much astonished. I was always under the impression that it was one of the things that the contractor had done, and I never protested, and I am perfectly willing to confess that I did not realize that it would make so much trouble in bolting up as it did. But I certainly never protested. I always thought that the punching of those small holes was unnecessary—at least, I always thought that the punching of the small holes for the 1-inch rivets was unnecessary, and I still think so.

The punching of the eleven-sixteenths of an inch holes for the seven-eighths of an inch rivets was only a decrease in size of one-sixteenth of an inch. And I always thought that was unnecessary until the change was made back to the larger holes. Then it was reported to me that they simply could not get good



rivets with the larger holes in the shop even. And, while I have never been able to understand (p. 40) it, I gradually came to the conclusion that there was something peculiar about this work which required the small holes.

But the fitting of the rivet holes after the first eight gates was so beautiful—was so nearly perfect—that I wondered why on earth they punched them with the small holes. When Mr. Jewel asked me to change them, I said, “By all means,” and then, as you know, they changed them, and they reported from Pittsburgh that it would not do, and they changed them back without telling me very much about it.

Q. Did you discuss the matter at any length with Mr. Hammer at that time, or was it merely a statement made by Mr. Hammer and acquiesced in by you?—

A. That is all—a statement of Mr. Hammer’s acquiesced in by me.

Q. Was the subject of small holes ever brought to your attention by any representative of the contractor while you were in Pittsburgh at that time?—

A. I do not remember distinctly; but I think either Mr. Marshall or Mr. McClintic told me they were going to do it, or had started to do it; but I would not swear to that.

May I make one addition?

Judge HARRAH. Yes.

Mr. GOLDMARK. In saying what I did about the condition of the inspection force at that time, I would like to say that I think individually they were very good men, indeed, and were kept on; I think it was a matter of organization entirely; I think all of those men were exceptionally good men.

Q. Is it not a fact that, whatever might have been the cause, if the organization was in the condition that you describe it would hamper the work of the contractor and tend to make it difficult for him to perform his contract?—A. I think it could not help doing so to some extent, and I think the force was not adequate in numbers until well in the summer of 1911.

Q. And, without attempting to place the blame for that condition, the fact would be that it existed?—A. I have never doubted it?

Mr. Goldmark explained in his testimony (pp. 119 to 124), quoted below, his understanding as to whether or not the specifications followed the usual practice, and also his understanding as to what would be usual or reasonable requirements in enforcing them.

Mr. GOLDMARK. I think my specifications were copies from the 1908 specifications of the New York Central Railroad, which you have in your requisition files here.

Mr. STERRETT. The contractor does not care what your copies are from; the thing is that you did not state what you wanted.

Mr. GOLDMARK. If we followed a well-established specification according to which the very largest work of one of the largest railroads in the country had been done, I think we followed the ordinary practice in our specifications and the justifiable practice.

Mr. STERRETT. If you had had the New York Central inspectors under that specification on your work it is likely that there would not have been any trouble; they would have had experience with it.

Judge HARRAH. Whatever specifications you think will illustrate your views, Mr. Wolfel, you may introduce as exhibits to-morrow; and whatever specifications you think will illustrate your view, Mr. Goldmark, you may introduce.

Mr. GOLDMARK. Well, Mr. Wolfel has a lot with him; I have not. But I referred in this report to a certain place in Trautwine’s Handbook—that is a standard book—and it has in it a statement of all the different specifications and what they require. Have you seen that compilation, Mr. Wolfel?

Mr. WOLFEL. Yes; but these things are all more modern.

Judge HARRAH. Are those specifications that you are introducing specifications which have been gotten up since this work was performed or were they specifications in use at the time the work was fully performed or being advertised?

Mr. GOLDMARK. That was after ours were written.

Mr. WOLFEL. Well, these Quebec specifications are dated September, 1911.

Mr. GOLDMARK. I am sure they are later than ours, because Mr. Monsarratt corresponded with me about certain points and asked me my opinion about them when they were writing them.

I would say that, regardless of any clauses of the specifications which may be desirable to get as an assistance to inspectors, the requirement of punching the rivet holes one-eighth inch smaller than the nominal diameter of the rivet has been established for fully 25 years, and the practice in the shops has been



essentially the same during all that time, and the results obtained have been practically the same as we get to-day. There have at all times been a small number of rivet holes that were mispunched, and they have been corrected either by enlarging the hole and making it slightly irregular in shape—which is the commonest method—or by reaming the hole out for a larger size of rivet. An excessive number of such errors and an excessive amount of error has never been permitted, and it seems to me the question is entirely as to how much error there was in our rivet holes.

By Judge HARRAH:

Q. Where a specification does not limit or indicate a rule by which inspectors are to be guided in demanding that rivets shall be cut out, or that holes shall be reamed in a particular way, would that not leave considerably more latitude to the judgment of the individual inspector in passing upon the work?—A. Well, I doubt whether it is feasible to lay down such rules, and, as I said a little while ago, I think the specifications in that respect agree with a great majority of the very best bridge specifications for punched and reamed work.

Q. Is it the usual practice in enforcing specifications that do not contain their own limitations as to the character of the work that must be done under those specifications, for the supervising inspector to give instructions to his subordinates in immediate charge as to the latitude that will be allowed?—A. When the matter comes up, I should say yes. Now, in requiring holes to be punched smaller and then reamed larger, there are two things aimed at: One is to remove the injured metal, which is always injured by punching. After reaming out the bar is stronger, as has been proved in many cases by experiment. I have made some myself.

The second reason for reaming out is to get a truer hole, so that the rivet shall be better, there shall not be irregular jogs or inlets in the rivet itself, and that it (p. 122) shall be possible to drive a better rivet, and also, I think, to make the test of the rivet as to tightness more certain.

In other words, if you have a rivet in a very rough hole, it may hang in one or two of these rough places in the plate, and when you hit it with a hammer it may seem secure. Now, in a perfectly smooth hole, the rivet has got to absolutely fill that smooth hole completely, in order to be tight under the hammer test. Consequently, my experience has been that, in many cases, you get more loose rivets on inspection and condemn more rivets in punched and reamed work than you would in rough punched work, simply because the roughness around the work holds the rivet so that it does not show the looseness, while it might readily become loose in actual use; and this little slight burr might let go of the rivet and you would have a loose rivet. That, in my opinion, is one of the reasons for using reamed work, and I do not consider reamed work absolutely necessary to the extent that some engineers do. But that is if you use the reamed work, it is to get that result, besides the result of not injuring the metal so much.

Now, in these lock gates, the rivets are in most places in excess of the number required for strength. We put in most of these rivets for watertightness. Also, the material is, in the great majority of places in the gates, in compression and not in tension.

A rivet in compression is not as severely strained, perhaps, as in tension—I do not know whether that is exactly (p. 123) right—but I will say that the material surrounding a rivet is less severely strained in case any injury is caused by the punching. In other words, this removal of a ring around the rivet is more important in tension members than in compression members. That is what I really wanted to bring out.

Now, in doing that, you are aiming at removing metal all around; in other words, you want the rivets to be punched as accurately as may be in the beginning, and you specify the diameter to which they are subpunched, with some regard to the probable error you are going to get in your punching. I do not think it is practicable to lay that down the way they do in the New York Central specifications, and I do not know any way, apart from the experienced judgment of the inspector in any given case, to tell you just how wrong you can let them be punched. If you get a number of rivets that are subpunched that do not clean up, the punching should be looked after. But in the different metals and different parts of a structure, I have never seen a rule whereby you can say that you have so many rivets subpunched so as to clean up properly. If you get more than a comparatively small number that are bad, you had better look to your punching and see that it improves. And I will say that when those first gates did not come out as well as



I thought they should, I would have looked to better punching, steel templates, and that sort of thing—because it can be gotten. Instead of that, the holes were punched very much smaller—not on instructions from me. But as to the (p. 124) instructions from the inspector as to just how many rivets he is to cut out and just how far he is to do it, I think that is a matter of common practice in riveting work which it is not necessary to specify—and I do not believe it can be specified in figures.

Mr. Goldmark states on page 166 of his testimony that “The rivet holes had been punched for eleven-sixteenth-inch for a long time, and the fit of those holes was extremely good. They were almost all concentric to the eyes.”

On page 193, Mr. Goldmark was asked this question:

Q. Do you think the greater accuracy in the holes secured by the smaller punching would in any way compensate for the delay in erection due to increased difficulty in the bolting up and the riveting?—A. Compensate whom?

Q. Compensate the contractor?—A. I think not. The holes were so very, very good that I do not think the question came up at all. In other words, the holes were so nearly concentric that if there had not been any reaming at all, we would have got very decent work; they were wonderfully cut.

Q. Was that on the first contract—4845?—A. No; it certainly was not. But you said the smaller holes, and they did not have the smaller holes on that.

Q. But the holes you speak about being so good now, were the holes that were made and punched after they had begun to use the steel templates in the shop?—A. Yes, sir; after 4847.

Q. Then with the use of the steel template in the shop you think the holes could have been made so accurate that there would have been no difficulty of erection in the field?—A. I have never had the slightest doubt on that subject. That is the reason I permitted them to go back to larger holes (p. 194).

Q. Do you think it was easier for the contractor to secure the passing of his fabricated material in the shop by reason of the holes being punched eleven-sixteenths inch than it would have been if they had been punched in accordance with the specifications?—A. Well, my previous answer, I think, was limited to the field work. In the shop the inspectors evidently first, and then again later, satisfied themselves that they could not get good work with the small holes. I have never understood exactly why they could not.

Q. You do think, however, that the work of erection was delayed and that the cost was increased by reason of the punching of the small holes?—A. Yes, sir.

(On page 197 Mr. Goldmark was asked this question:)

Q. At the time of making such tests as you did make for water-tightness, did you find any considerable number of leaks around the rivets?—A. Very few, and very unimportant ones—either around the (p. 197) rivets or through the joints. It was as good as any work that I ever saw of that exact nature.

Q. You do think we got a good job?—A. Oh, there is no doubt whatsoever.

Q. Do you not think we got a first-class job?—A. Do you mean this water-tightness or the whole thing?

Q. The whole thing.—A. I think we got the best gates in the world. I think the workmanship could not be improved upon.

Q. Do you think your specifications as drawn were such as to entitle the Government to demand such work as would produce the best gates in the world? Of course, I understand that the question is a little too broad; it is asked more for your judgment on what you think you had a right to demand under those specifications.—A. I will say that it has been claimed that the specifications in some respects were too general in requiring perfection. I meant to word them in such way that we could ask, as far as water-tightness goes, as good a job as could be obtained, by taking very great pains and expending considerable time and money in getting those joints tight; and I say that they are a good deal tighter than I thought we could get them. I tried to cover it in such a way that it would not be a hardship. Whether that is fully obtained by my wording may be questioned. In other words, if I had said I wanted perfect contact, I knew perfectly well that there is no such thing as perfection; but, on the other hand, I did not want to be hampered when the time came with the claim that certain other things were good enough; and I hoped and expected that bidders would make allowance for that, and allow somewhat liberally for difficulties of good work. But I also tried to provide in the design



that that result could be obtained with as little trouble as possible; and, I think, on the whole, the method provided for obtaining this water-tightness worked out well, and perhaps did or did not lead to much unreasonable work. But that may be a matter of difference of opinion.

On page 199, Mr. Goldmark was asked this question:

Q. Do you think that your pride in obtaining a first-class job, in fact, a superior job, on the lock gates, would influence you, or did influence you, probably, in determining the character of work that you would demand under the specifications where they were general and left substantially to the judgment of the person enforcing them?—A. I do not think so; but I will say that I was not willing to take any chances as to whether a certain thing a little less good might, in my opinion, give good enough results—especially in the field. I think in the shop I do not recall anything I ordered that was anything more than required under quite ordinary and usual practice.

As to the water-tightness in the field, it might have been possible to relax at times; but I honestly did not feel as if I ought to take the chances of getting something “good enough.” I felt more certain of getting that result by being somewhat more particular. Though I did not think that I was going beyond what could be asked reasonably under the contract—although I will say I think we went about as far as we could go under the contract in what we asked. I would have protested against a more severe interpretation.

The testimony of Mr. Howard H. McClintic, vice president of the McClintic-Marshall Construction Co., relative to the necessity of changing to iron templets and reducing the size of the holes is found on pages 82 and 83 of General Exhibit 19, volume 19, and, for easy reference, is quoted below:

A. As you know we started out to punch the work in accordance with the specifications, using our usual care in doing the work. When we started to put up the first leaves, it was found that all of the holes did not match perfectly. The inspectors insisted upon practically all the holes cleaning up.

We found, after going into the matter carefully, that this was practically impossible if the holes were punched in accordance with the specifications.

In the meantime, the inspectors would neither accept nor reject the material, which held up the shopwork, and consequently delayed the erection of the work.

After a thorough investigation and consultation, it was found that the only way the results required by the inspectors could be obtained was to discard the usual methods of doing the work, substitute steep and iron templets for wooden templets in a great many cases, and punch smaller holes in the work. We would call your attention to Mr. Hammer's letter of February 23, 1911, addressed to Mr. R. A. Pendergrass, in which he advises punching the holes smaller—

Q. Does he use the word “advise” there?—A. Yes, sir. “I would advise punching smaller holes.”

Q. I thought the word “suggest” was in there.—A. No, sir; “advise”;—and our instructions, issued to the drafting department, under date of February 23, 1911 (p. 83), carrying out the recommendation of Mr. Hammer. To secure the degree of accuracy required by Mr. Hammer, there was no alternative but to change our method and use the smaller holes, in accordance with his advice and recommendations. Does that cover that?

Q. It covers it your way—from your point of view.—A. Well, I think that is exactly how the thing occurred.

Q. Did you have any conversation with Mr. Hammer in relation to this particular subject, and the advisability of punching smaller holes, before that letter was written?—A. Before the letter was written?

Q. Yes.—A. I could not say that I had, personally.

Q. Well, that is what I want to know, whether you had it personally or not?—A. In other words, I could not say that I personally took that matter up with Mr. Hammer.

Q. Did you take it up with any of the Commission's inspectors?—A. It is probable that Mr. Neeld took this matter up with Mr. Hammer direct. Mr. Neeld was manager of the shop at that time.

Mr. H. H. Wagoner, the chief shop inspector of the McClintic-Marshall Construction Co., states, on page 99 of General Exhibit 19, volume 19, of the testimony, that the Commission's inspectors were



at times unreasonably close in their requirements as to the spacing of the holes.

The pertinent part of the testimony of Mr. Wolfel in connection with the spacing of the holes and the reason for adopting steel templets is found in quotation made from the testimony of Mr. Wolfel. (See pp. 98, 99, and 100 of this report).

Mr. Price became chief inspector May 5, 1911. The determination to use steel templets and the change in the diameter of the holes was made nearly three months before he took charge as chief inspector. There was still in the yard, however, a considerable amount of material that had been fabricated, with the holes punched in accordance with the requirements of the specifications.

In his report, General Exhibit No. 3, volume No. 3, of the evidence, on page 9, in describing the character of the inspection, Mr. Price states:

That the inspection was close in certain instances must be admitted, but it must be understood that the particular character of the work required it. Special attention was paid to the accuracy of the work on diaphragms A and to the spacing of the holes in the girders for diaphragm A connections and also length of girder and spacing of holes for sheathing.

The reason why Mr. Price considered it necessary to insist upon accurate workmanship is stated on pages 10, 11, and 12 of his report referred to above. For ready reference these pages are quoted below:

The reason why it was considered necessary to insist upon accurate workmanship is shown by certain paragraphs in the specifications of Circular No. 576, and it is also shown from the numbers of letters from Mr. Goldmark and Mr. Hammer relative to the subject of accuracy of certain members.

In Mr. Hammer's report to Mr. Goldmark, February 16, 1911, file 22-1, is this paragraph:

"A high degree of accuracy in the shop work is required in order to get everything to match properly. Such accuracy is being demanded and the Contractors are working to reach this result."

Mr. Hammer's letter to Mr. Wolfel, January 6, 1911, file 74:

"In work of this type with a great number of identical parts, I expect to see greater perfection than in work where little or no duplication is possible."

Letter of Mr. Hammer to Mr. Price, dated August 21, 1911, file 175, relative to accuracy of A frames:

"Replying to your letter of the 11th instant, in regard to inspection of A frames, asking to what extent the A frames should be permitted to be out of square \* \* \* Mr. Goldmark indicates that there should be no difficulty in getting this work almost absolutely perfect.

"Personally, I believe that it should be possible to get the A frames less than one thirty-second inch out of square, and would advise that all A frames which do not come within this limit should be corrected."

Mr. Goldmark's letter to Mr. Hammer, June 3, 1911, file 64, relative to A frames:

"You can see that it is of the utmost importance to get great accuracy in this matter. \* \* \* I do not expect impossible accuracy in this or other matters, but the designs require a uniform bearing, both in the webs and on the diaphragms, and it is a very slow process to grind out these variations in the field."

That the different members were used without reference to the leaf or contract number is shown in Mr. Goldmark's letter to Mr. Hammer, dated June 6, 1913, file 64:

"All girders of a given mark were used freely and interchangeably in erection, and the same was, of course, the case in regard to the frames, intercostals, and other parts."

This in itself demonstrates the necessity for accuracy.

Paragraph 21, Circular 576, referring to horizontal girders:

"Especial care must be taken to have the ends of all girders milled to the exact dimensions and angles given on drawings."

Paragraph 23, circular 576, referring to vertical diaphragms:

"The vertical sides and top and the bottom surfaces are to be milled to the exact dimensions given on the drawings, making a very close fit with the adjoining plates."

Paragraph 24, circular 576:

"Water-tight frames, \* \* \* and on one side the flange or bounding angles will be crimped over the flange angles on the horizontal girders. The crimping must be smithed in such a manner as to obtain a close fit of both sides of the bounding angle to the adjoining structural parts and insure a good contact for calking. In no case will the use of steel shavings be permitted for filling openings where the crimping is poorly done \* \* \*. The top and the bottom flange angles of all vertical frames shall be milled."

Paragraph 34, circular 576:

"All bolts connecting heel, pintle, and end reaction castings to the leaf shall be turned to a driving fit; the holes in the riveted structural parts must be reamed or drilled in the field to insure perfect fitting."

Paragraph 36, circular 576:

"The outside burrs must be removed from all reamed or drilled holes by slightly countersinking the holes. After the reaming is done the parts assembled are to be riveted up as far as possible without taking them apart."

Paragraph 38, circular 576:

"All countersunk rivets shall be shipped smooth, unless otherwise noted on drawings. No recupping or setting up of rivets after driving will be permitted, nor the use of driftpins for enlarging the holes."

Paragraph 40, circular 576:

"All sheared edges and ends of material shall be planed off to a depth of three-sixteenths inch, or as much more as may be necessary to remove the sheared surface of the material."

Paragraph 43, circular 576:

"All workmanship must be first class in every particular, and all methods used during manufacture shall be satisfactory to the chief engineer or his authorized representative. Material undergoing fabrication will be inspected by the inspectors employed by the Commission. All material coming from the mill shall be perfectly straight before any work is done upon it at the Contractor's works."

Paragraph 54, circular 576:

"All material shall be of uniform quality through the mass of each object and free from all defects."

Paragraph 58, circular 576:

"Material may be rejected at any stage of manufacture, fabrication, and erection for surface or other injurious defects, either previously existing or developed in working."

Paragraph 104, circular 576:

"Before applying any paint or other covering, all rolled steel shall have rust and mill scale thoroughly removed by sand-blasting. \* \* \* Any grease must be carefully cleaned off with gasoline or similar fluid."

Paragraph 121, circular 576:

"The vertical ends of the leaves must be kept straight from the top to the bottom, so that the bearing plates on the quoin and miter posts may be truly in line and make proper contact."

In Mr. Hammer's letter to Mr. Price, dated July 16, 1912, file 70-4, is the following paragraph:

"Confirming verbal instructions given you previously, you are advised to reject all material badly corroded or pitted, as only first-class material free from rust or pit marks must be used for our work."

In a letter of Mr. Goldmark of June 23, 1911, part of which is quoted in Mr. Price's report above given, it is stated, quoting the last two paragraphs:

You can see that it is of the utmost importance to get great accuracy in this matter (referring to the ends of diaphragm A), as well as in the reaming out of the rivet holes for the connections which you are doing in the shop. I do not expect impossible accuracy in this or other matters, but the designs require



a uniform bearing, both on the webs and on the diaphragms, and it is a very slow process to grind out these variations in the field.

If you do not feel entirely satisfied with the placing of the rivet holes, you had better omit the shop reaming and have these holes reamed out in the field, though I should regret making this move.

That Mr. Price considered that the Contractor could not do the work with such accuracy as was being demanded of him under instructions from Mr. Hammer and Mr. Goldmark without reducing the size of the subpunched holes to eleven-sixteenths inch is demonstrated from the fact that after permission was given to punch all holes eleven-sixteenths inch in diameter he recommended that Mr. Hammer request the contractor to return to the punching of small holes. This request was made in a letter of April 12, 1912, found in Exhibit 74 of the testimony of Mr. Wolfel, volume reference No. 7, which is as follows:

I advise returning to the former method of punching—eleven-sixteenths inch for all holes for field connections, except holes in girders, which are punched smaller and are reamed to jig in shop. To facilitate fitting up in the field I would suggest following the method lined out by Mr. Pittman in the third paragraph of his letter of instructions to the shop relating to "change in size of holes," dated April 4, 1912.

In a report of Mr. Hammer to Mr. Goldmark of April 5, 1912, quoted on page 18 of Mr. Price's report, Mr. Hammer states:

Two girders have been fitted up and reamed on this order [referring to contract 4861]. The result was unsatisfactory on account of a great number of holes not "cleaning up" when reamed. I have therefore requested the contractors to punch smaller holes on the balance of the work.

In a report to Mr. Hammer of April 9, 1912, Mr. Price stated, in relation to the shop rivets in girder G-3, serial 2, the second girder of contract 4861, that:

Mr. Gauge reports 225 unfair holes after final reaming, and the conditions in this respect worse than any girder for contract 4845.

It is further stated in this report to Mr. Hammer:

Your instructions were followed relating to reaming to larger size holes for shop rivets in the upstream chord angles, selecting holes which were most out of true.

In a report to Mr. Hammer, dated April 8, 1912, Mr. Price stated:

It is to be regretted that the size of the subpunched holes was changed from eleven-sixteenths inch to thirteen-sixteenths inch, especially so as to holes in the girders and sheathing. The first two girders, G 3 R & L, serial 1 and 2, contract 4861, proved this method to be unsatisfactory, the holes being too large to permit of proper adjustment of the chord angles, and thus throwing many holes of the web plates out of true, as reported on April 5. As a number of chord angles and web plates have been subpunched either thirteen-sixteenths or three-fourths inch we may expect more or less trouble in this respect until all of this material is fabricated.

Within a few days after Mr. Price became chief inspector he examined girder G 5 R, serial 48, on contract 4845, which had been rejected by Mr. Goldmark when he was examining the condition of the work with Mr. Hammer in April, 1911. On May 12, 1911, Mr. Price reported to Mr. Hammer as follows:

After carefully examining girder G 5 R, serial No. 48, shop order 4845, formerly rejected by Mr. Goldmark, I recommend that the whole girder be rejected. The only parts that it might be possible to be made use of are the center web, stiffeners, and small minor detail parts.

The manner in which this girder had been fabricated, and the fact that it was personally passed upon by Mr. Goldmark and Mr. Hammer and rejected, probably indicated to Mr. Price, at least in a general way, the character of the work which would be unsatisfactory.

The number of unfair holes of girder G 5 R, serial No. 48, was 130, or 6.1 per cent.

In accepting the material under contract 4845 Mr. Goldmark did so with the reservation that it would be at the contractor's risk as to whether or not the work would go together properly in the field.

The facts show that the work when erected was entirely satisfactory.

In a letter from Mr. Goldmark to Mr. Hammer, dated July 2, 1912, he stated:

I am glad to see that two of the leaves have now been tested for watertightness and were almost absolutely perfect. Mr. Guynn stated he had never seen more perfect preliminary tests than these.

In his testimony given in Washington, page 38, quoted in this report (p. 119), Mr. Goldmark stated:

I always thought that the punching of those small holes was unnecessary—at least I always thought that the punching of the small holes for the 1-inch rivets was unnecessary, and I still think so.

He further stated:

The punching of the eleven-sixteenths-inch holes for the seven-eighths-inch rivets was only a decrease in size of one-sixteenth inch. And I always thought that it was unnecessary until the change was made back to the larger holes. Then it was reported to me that they simply could not get good rivets with the larger holes in the shop even. And while I have never been able to understand it, I gradually came to the conclusion that there was something peculiar about this work which required the small holes.

But the fitting of the rivet holes after the first eight gates was so beautiful—was so nearly perfect—that I wondered why on earth they punched them with the small holes. When Mr. Jewell asked me to change them I said, "By all means," and then, as you know, they changed them, and they reported from Pittsburgh that it would not do, and they changed them back without telling me very much about it.

In his report to Mr. Goldmark of February 16, 1911, Mr. Hammer stated:

The erected parts of the 54-foot 8-inch high leaf did not match as well as should be expected; especially is it noted that the rivet holes in the girders run somewhat irregular. The contractors have been requested to make steel templets, which are now being used in checking up all girders in order to ascertain which girders can be considered as interchangeable members.

A high degree of accuracy in the shopwork is required in order to get everything to match properly. Such accuracy is being demanded, and the contractors are working to reach this result.

Mr. Hammer insisted at first that he must inspect and pass on all of the girders (see pp. 14 and 15 of Mr. Crane's testimony).

On page 30 of Mr. Crane's testimony in relation to inspection he states:

A. First, Mr. Marshall, several times when we had rejected material, stated before Mr. Hammer and myself that Mr. Goldmark had made the statement that he required nothing but common, ordinary, commercial work at the Fort Pitt Hotel on the evening of Wednesday, about the 12th (meaning the 12th of April).



On page 31 of Mr. Crane's testimony he states:

I repeated this to Mr. Goldmark on that evening, and I stated I did not say any such thing; but I did say that the material should be of common, ordinary, commercial material, but that the fabrication must be of the best class of material, equal to and better than required by the Navy Department, and on that statement I was doing or had been doing much of the work.

The reporter evidently got his pronouns mixed in some of the above statement, using "I" where he should have used "he," as referring to a statement made by Mr. Goldmark.

On page 39 of his testimony Mr. Crane states, in relation to the class of work that was performed by the contractor, that—

There might have been a misunderstanding—evidently was a misunderstanding—between Mr. Marshall and Mr. Goldmark as to the quality of the work.

These statements show very clearly that there was a decided difference of opinion between Mr. Hammer and the representatives of the contractor as to the quality of work that should be produced under the contract.

We have not been able to have the testimony of Mr. Hammer, but there are letters in the files which express pretty clearly Mr. Hammer's views of the accuracy he had a right to demand in the fabrications of this work. In a letter to Mr. Wolfel dated January 6, 1911, he states:

*I. C. C. 576—Manufacture of horizontal girders.*—As you will recall, I have formerly verbally called your attention to some imperfections in the manufacture of the horizontal girders. On the first girder assembled the bent chord angles did not draw up properly to the web plate, and the same trouble has been found on the ninth, sixteenth, and eighteenth girders now assembled. It is also found that a number of horizontal stiffeners have not a close seating to the chord angles, this imperfection being caused by the crimping being deeper than necessary and possibly also from drillings which have been left between the seating surfaces. The amount of unfair holes—that is, holes that won't ream out properly—has not been decreased in the girders which have been reamed recently.

As stated above, your attention was called to these errors before, and it was promised that they would be corrected and improvements made, as far as possible, in later work. I am sorry to see that the same mistakes are still being made. In work of this type, with a great number of identical parts, I expect to see greater perfection than in work where little or no duplication is possible.

One of the remarkable things in connection with the testimony and the records with relation to the change in size of the subpunched holes is the fact that the subject was not taken up with Mr. Goldmark at the time he was at the contractor's shops inspecting the material in the yard with Mr. Hammer in April, 1911.

Mr. Goldmark does state, however, that he thinks either Mr. Marshall or Mr. McClintic told him that they were going to change the size of the holes, or had started to do it, but that he would not swear to that (see p. 40 of his testimony).

After the first eight leaves practically all holes were subpunched or drilled eleven-sixteenths inch. This material was bolted up with five-eighths inch bolts, and the evidence shows that the punching was so good that the contractor had no difficulty in passing the five-eighths inch bolts through the material. The punching after the first eight leaves was done very accurately. There does not seem to be any reason why the size of the holes should have been reduced after the contractor began the use of steel templets.



On contract 4845 for the 54-foot 8-inch leaves, the total amount of material under item 1 was 6,467,104 pounds. The Isthmian Canal Commission has a record of rejections for shop errors under this contract of 112,522 pounds of material. The rejections amounted to 0.0173 per cent of the total amount of material of this contract. The entire amount of material, including spare parts, fabricated for the lock gates, item 1, was 106,963,039 pounds. If the percentage of rejection of material under contract 4845 had been maintained throughout the fabrication of the work there would have been rejected for shop errors 1,850,460 pounds of material. The same character of records from which the 112,522 pounds of material is shown to have been rejected on contract 4845 show that all of the rejections made on the contract amount to 396,333 pounds. Neither of these amounts include material rejected at the pickling plant and material rejected for surface defects, but only cover rejections in shop and yard of finished and partly finished parts of members, as the Commission's inspectors kept a record of. (See Exhibit No. 8 of Mr. Price's testimony, taken at Rankin, Pa., June 30, 1915, General Exhibit No. 18, vol. No. 18.) More than 50 per cent of the rejections on contract 4845, covering the material for the 54-foot 8-inch leaves, was for errors in punching and the spacing of the holes.

The testimony above quoted and referred to shows conclusively that the contractor experienced great difficulty in the manufacture of the material for the first contract, 4845, so as to meet the requirements as to accuracy in the spacing of the holes and in other particulars that were demanded of him by the Commission's engineers and inspectors.

Below is given a brief summary of the essential facts as to the spacing of the holes, and the conclusions of the committee as to the responsibility for the increased expenses and damages resulting to the contractor on account of the change in the size of the subpunched holes from that provided for in the specifications.

#### SUMMARY.

Mr. Conley, Mr. Wolfel, Mr. Marshall, Mr. Neeld, and Mr. McClintic think the requirements as to the accuracy in the spacing of the holes was in excess of what was necessary to secure first-class work within the meaning of that term as applied to the lock-gate material under the usual practice.

Mr. Goldmark, Mr. Hammer, Mr. Guynn, Mr. Crane, and Mr. Price do not think their requirements in the accuracy of the spacing of the holes was any greater than should have been demanded under the terms of the contract, nor any greater than was justified under a fair and reasonable interpretation of the contract.

Mr. John N. Ostrom thinks the demands made upon the Contractor were unreasonable and impractical of accomplishment under the specifications and were outside of the usual practice and more accurate than the Contractor might reasonably have expected to have enforced against him under the specifications as drawn.

The work on the first contract, 4845, being the 54-foot 8-inch leaves, was so unsatisfactory to Mr. Hammer that upon his advice the size of the subpunched and drilled holes was reduced to eleven-sixteenths inch throughout. The Contractor believed it was necessary to make this change from the specifications in order to get the



work accepted in the shop under the conditions that prevailed with Mr. Hammer in charge of the inspection.

It is reasonably certain from the weight of the evidence that either too great accuracy was demanded in the spacing of the holes or that the material was such that the necessary accuracy could not be obtained without smaller holes. Advising and practically requiring the Contractor to fabricate the material with the smaller holes, except the first eight leaves was a requirement that was not authorized under the contract.

The evidence establishes the fact that the difficulty and increased expense that would result from the use of small holes was not fully appreciated by the Contractor nor by Mr. Hammer or Mr. Price, and probably not by Mr. Goldmark. If they had been, it seems inconceivable that the Contractor's representatives would not have taken the matter up with Mr. Goldmark in a vigorous manner when he was there in April, 1911, if not before, and if Mr. Goldmark had fully appreciated the resultant difficulty from bolting up with small bolts in the field he would certainly have directed a return to the specifications as to the size of the holes.

The damage to the Contractor was, however, just as great as it would have been if all the consequences had been foreseen.

The work on the first eight leaves proved to be better where erected in the field than Mr. Goldmark, Mr. Hammer, or the representatives of the Contractor thought it would be, but it was not so good as subsequent work done under the contract. It was undoubtedly better than it would have been without the corrections that were required to be made by the Commission's inspectors.

The ultimate facts seem to be as follows:

(1) The Contractor did not fabricate the work on the first contract, 4845, for the 54-foot 8-inch leaves as well as it should have been done for first-class work under the specifications, reasonably construed, although it may have been equal to bridge work fabricated under its usual practice.

(2) The Commission's inspectors were demanding work of a finer grade and of greater accuracy than they had a right to demand under the specifications, reasonably construed. More latitude should have been allowed in passing material with unfair holes and more latitude should have been allowed in the correction of material containing unfair holes, if it was intended that the work should be done under the original specifications.

(3) The responsibility for the first congestion in the shop was in part due to the Contractor and in part due to the unreasonable and unwarranted requirements made by the Commission's engineers and inspectors.

(4) The United States has profited by the unreasonable demands of the inspectors to the extent that it got better work than it had a right to demand under the specifications, unchanged, and the Contractor has been damaged by the action of the inspectors to the extent that he incurred expenses and suffered loss under the changed specifications in an endeavor to comply with the unreasonable and unwarranted requirements made upon him in an effort to secure such accuracy in the spacing of the holes that they would all, or practically all, clean up.



(5) This degree of accuracy was practically impossible to obtain and was not a reasonable requirement under specifications that did not call for it in terms nor specify what per cent should clean up or how they should be remedied.

(6) Subsequent to the fabrication of the material on the first contract, 4845, for the 54-foot 8-inch leaves, the work was first-class, even under the rigid requirements of the Commission's engineers and inspectors.

The conclusion of your committee is that if the degree of accuracy in the spacing of the holes required by the engineers and inspectors of the Isthmian Canal Commission and the demand by them that practically all holes should clean up was necessary, it was so impracticable as to be nearly impossible from a practical standpoint to obtain it without a change in the specifications. If the accuracy in the spacing of the holes and the demand that the holes should practically all clean up was unnecessary, then the requirements for such accuracy and the demands with relation to the cleaning up of the holes should not have been made.

Under the first assumption the United States forced the Contractor to do the work under different specifications from those upon which his bid was based, and in justice, equity, and fairness should bear the increased expense and loss of the Contractor caused by this change, except in so far as the Contractor may have contributed to the loss by his failure to observe the provision in the contract requiring him to present his claim at the time.

Under the second assumption the increased expenditures and loss were due to the unnecessary requirements of the Commission's engineers and inspectors. Your committee is of the opinion that the reduction in the size of the holes from those called for in the specifications was principally due to one or the other, or both, of the above causes.

The loss and damage to the Contractor due to this change, so far as it can be traced, should therefore in equity, fairness, and justice be borne by the United States, except in so far as he may have contributed to the loss by his failure to present his claim in the manner provided for under the terms of the contract. (See pp. 308 to 314, inclusive, of this report.)

*Steel templets.*—The use of steel templets in the fabrication of material of the class of the lock gates is unusual except where they are specifically provided for. The contractor was justified in assuming that the usual methods of fabrication would meet the requirements, except in so far as the inherent character of the work indicated or the specifications prescribed that other methods should be adopted. The contractor had a right, therefore, to act on the assumption that steel templets would not be required. But even with their use, the material could not be fabricated to the satisfaction of Mr. Hammer and Mr. Price without a reduction in the size of the holes. That this is true is demonstrated by what took place in the shop after permission was granted by Mr. Goldmark, in his cablegram of January 12, 1912, to punch all holes thirteen-sixteenths inch in the shop. (See report of Mr. Price, General Exhibit No. 3, vol. No. 3, pp. 15, 16, 17, 18, 19, 20, and 21; see also testimony of Mr. Wolfel, pp. 221 to 232, inclusive, General Exhibit No. 7, vol. No. 7.)



The loss and expense of the contractor suffered by reason of being compelled to use steel templets instead of wooden templets should in equity, fairness, and justice be borne by the United States.

The greater part of the difficulty in the fabrication of this material from December, 1910, to March, 1911, was caused by the demands made by Mr. Hammer for great accuracy in the spacing of the holes, and the demand that practically all the holes, when reamed out, should clean up, although a part of it was undoubtedly due to unsatisfactory workmanship in the beginning. (See testimony of Mr. Guynn, General Exhibit No. 6, vol. No. 6; Exhibit No. 1 in that testimony being a letter from Mr. Guynn to Mr. Hammer, dated March 1, 1911, giving details as to the condition of the work that had been assembled in the yard. See also letter of Mr. Guynn to Mr. Hammer, dated February 15, 1911, introduced in connection with the testimony of Mr. C. M. Neeld, General Exhibit No. 23, vol. 23. In this letter Mr. Guynn characterized the work as follows: "The work in general is unsatisfactory." Also see pp. 76, 77, and 79 of this report. See testimony of Mr. Crane, General Exhibit No. 5, vol. No. 5, pp. 10 and 11. In this testimony Mr. Crane states that the holes had not been accurately punched or the templets accurately made. This testimony is quoted on pp. 82, 83, and 84 of this report.)

On pages 30 and 38 of Mr. Crane's testimony he explains the character of the inspection, and states on page 38 that—

It did not compare with first-class bridge work, was not as good a work as we had received from the same shops on the New York tunnel work, or that we received later from the same shops on the Hell Gate Bridge. You must bear in mind that the lock question is simply a problem by itself, different from bridge construction, and yet with the conditions of the work at that time I felt that it was not up to first-class work, as required by the specifications, and I had been instructed on by Mr. Goldmark.

Mr. Wolfel points out on pages 121, 122, 123, and 124 of the testimony of Mr. Crane that it was the character of the work that caused the difficulty at the start. (See pp. 106-7-8-9 of this report.)

Mr. Hammer thought the work was so bad that he requested the contractor to make steel templets in order to check up the work to determine whether the girders were interchangeable or not.

In relation to some of the girders, Mr. Goldmark stated in his testimony, pages 32 and 33, that—

They certainly were not as good as they should have been. (See p. 114 of this report.)

Mr. Goldmark also stated in connection with the action of Mr. Hammer, that—

Mr. Hammer was much worried, but I think I would have felt about the same as he did about these particular girders. I can not say but what I had approval of what he had done in that matter at that time. I do not see that he could have done any other way. (See p. 115 of this report.)

That the contractor had notified Mr. Jewel that some of the material had not been very well punched is apparent from a letter from Mr. Jewel found in the testimony of Mr. Wolfel, Exhibit 68-A. In this letter Mr. Jewel stated:

Not having heard anything from you for two weeks, I am at a loss to understand what disposition, if any, has been made of the badly punched material.

When Mr. Goldmark was there in April he rejected one girder, serial No. 48 G 5 R, with the exception of some few pieces. The



subject of bad holes and bad punching and bad spacing of holes was then acute, yet the testimony does not show that the subject of reduction in the size of the holes was specifically taken up with Mr. Goldmark at that time. If the punching of the holes had been as good as the Contractors now insist that it was on these first eight leaves, it would have been the natural thing for them to have taken up this subject with Mr. Goldmark and vigorously presented their contention. This indicates clearly that the Contractor must have thought at that time that there was considerable inaccuracy in the punching of the holes, at least sufficient to justify the statement made in this report that a part of the difficulty in the fabrication of the material from December, 1910, to March, 1911, was due to unsatisfactory workmanship in the beginning. It is insisted, however, by the Contractor that as the work went together satisfactorily in the field and produced good results that the work in the shop must have been first class in the beginning.

As heretofore shown, something like 50,000 to 60,000 pounds of chord angles were cut off, and all told there was 112,522 pounds of material rejected on contract 4845, and it is entirely problematical as to how the erection of the leaves for the 54-foot 8-inch gates would have been effected if all of this work had been accepted as originally tendered for acceptance by the Contractor.

It is the opinion of your committee, therefore, that some of the difficulty experienced by the Contractor in the early part of the fabrication of this material was due to unsatisfactory workmanship. The meaning of "unsatisfactory workmanship" as used here, is that the work was not such as should have satisfied a reasonable and competent inspector under a reasonable and fair interpretation of the specifications.

The extent to which the output of shop 2 was affected and the expense of fabrication of the lock-gate material was increased by unsatisfactory workmanship in the beginning, will be determined in the final conclusions reached by your committee as to the amount to be allowed under claim 2.

The principal details of construction, exclusive of the spacing of the rivet holes, where the Contractor claims the requirements of the engineers and inspectors were greater than called for by the contract are: Calipering, wedges or fillers, grinding rivet heads, chipping and finishing, vertical diaphragms and vertical frames, foot-walk frames, rusting and pitting, turned bolts. (See Claimant's Brief of Testimony, p. 42.)

The testimony shows in as much detail as it was practicable to obtain, just what took place in the shop in connection with each of the operations specified above. Your committee also examined such records of the Isthmian Canal Commission as contained information showing what was done by the Isthmian Canal Commission's inspectors, and what they required the Contractor to do in connection with each of the operations specified above.

The circular invitation upon which the bid was based contained a form of contract, and in article 3 of this contract the character of the inspection to which the material would be subjected in the shop is set forth in detail. This article of the contract is as follows:

ARTICLE 3. It is further understood, covenanted, and agreed that all materials and workmanship used and applied under this contract, in details and



finish, shall be first class and of the very best quality, and that all materials, both in the form of raw materials, and at every stage of manufacture, and all workmanship, shall from the beginning to the end of the work be subject to the inspection of the chief engineer of the Commission, or his authorized representative, and that the Commission's inspectors shall have free access at all times to any works where any raw materials or manufactured parts used or to be used in the construction of any gates, fixed parts, or any materials for spare parts covered by this contract, are located, for the purpose of examining such raw materials or manufactured parts, and for the purpose of witnessing any and all processes of manufacture, and they shall have free access at all times to any and all parts of the erecting plant and all other parts of the work on the Isthmus; and the Contractor shall furnish such inspectors free at all works where any material is being manufactured or fabricated under this contract, suitable office room, and such plain office furniture and drafting boards as they may require for the proper transaction of their business for the Commission. The Contractor shall also furnish, at his own expense, all materials, test pieces, and full-sized members, properly machined, required for making tests and the use of approved testing machines, satisfactory to the chief engineer of the Commission, or his authorized representative, and convenient to the work where the inspection is being made, and all labor and appliances necessary for handling material while undergoing surface inspection, and for making tensile, bending, and other tests.

It is further understood, covenanted, and agreed that the Commission's inspectors may at any time reject any or all work or material not in accordance with this contract, and the right to reject any and all defective work or material shall continue until final inspection and acceptance and payment for material and work herein provided for, regardless of any prior inspection, payment, or act of the Commission, and such defective or unsatisfactory material or work shall be promptly removed, remedied, or replaced by the Contractor, without expense to the Commission. Should the Contractor fail to promptly remove, remedy, or replace any defective or unsatisfactory work or material, after being notified so to do, the Commission shall have the right to furnish all labor and material necessary to remedy the defects and to charge the cost thereof to the Contractor.

This article of the contract clearly indicated that the material would be subject to close inspection by the Isthmian Canal Commission's inspectors. The fact that the material was fabricated in the United States, to be shipped nearly 3,000 miles and erected, was another reason why the material should have been subjected to close inspection in the shop. This fact, however, would not be a reason for establishing unnecessarily close limitations or requiring unnecessary accuracy as to the character and finish of the work.

Considerable evidence, in fact a great deal of evidence, has been produced in this claim tending to establish unreasonable demands made by the Commission's inspectors in most of the details of construction above specified, but it has not been possible for your committee to determine in each instance just to what extent the demands were unreasonable, nor has it been found possible to fix a specific valuation as to the excess cost that was occasioned by unreasonable demands or unusually close requirements as to each of these operations. The facts do show, however, that in each of the particulars mentioned, except as to turned bolts, the requirements of the contract were at times exceeded, and that these excesses must have affected the cost of fabricating the material.

The contention as to each of the above items (top of p. 144) will be considered briefly:

*Calipering.*—The material was calipered in the first part of the contract, in the receiving yard, to determine the thickness. This seems to have been discontinued. The plates were calipered at the



pickling plant for identification. (See testimony of Mr. Pittman, p. 11.) They were next calipered at the laying-off and punching department, to see that the thickness of the plate corresponded with the mark. (See p. 12 of Mr. Pittman's testimony.) The next calipering was done at the planer, at the lower end of the shop, to determine approximately the weight of the plates. (See pp. 12, 13, and 14 of the testimony of Mr. Pittman.)

The calipering of the plates at so many places was an unusual shop requirement. (See testimony of Mr. Pittman, vol. 12, pp. 11 to 31; testimony of Mr. Reed, vol. 10, pp. 112 and 134 to 136 and 138 to 143; testimony of Mr. Crane, vol. 5, pp. 51 to 59; testimony of Mr. Price, vol. 10, p. 34; testimony of Mr. Wagoner, vol. 19, p. 121; and Mr. Hurlston, vol. 14, pp. 41, 42, 67, and 68.)

The Contractor claims that all of this calipering should have been done at the mill under paragraphs 76 and 77 of the contract. The material was calipered at the mill. (See testimony of Mr. Crane, vol. 5, p. 55.)

The contract gave the Isthmian Canal Commission permission to perform this operation as a part of the inspection of the material, if it was deemed to be necessary by the inspectors, but gave it only in the general authority to inspect the material at every point, and it is probable that there may have been too much handling required to enable the Isthmian Canal Commission's inspectors to perform this operation.

Mr. Pittman states, on page 27 of his testimony, that he thinks three men would have spent about one-third of their time, which would have been equivalent to one man working all the time. This would have included all the calipering that was done at the lower end of the yard after the plates had been planed. This estimate is probably too high. Mr. Reed says they do not do calipering on other work at all. (See Mr. Pittman's testimony, p. 30.) Mr. Price was asked to state briefly what was required by the inspectors at the time they were inspecting the plates, after they had been punched and planed.

Mr. Price's statement is found on page 23 of Mr. Pittman's testimony, and is as follows:

The plates, after they were taken from the planers, were put on skids at the door of the shop, just inside the shop door. They generally came out in lots of four, and we checked up the top plates and measured up the holes, and then lined up the holes by looking through them; if they lined up all right, that completed the inspection of those four plates. If the inspection mark was on the top plate of the four plates, we raised that up for calipering, and as I remember, we calipered in the center of each end; we raised one end up, and then went to the other end and had that raised up. Then we raised the next plate. If the erection marks were not on top of the plate, that plate had to be turned over or raised up high enough so that the inspectors could see the erection mark—the original erection mark. Each plate was calipered at each end at that point.

Further statements of Mr. Price in connection with the operation of the calipering are found on pages 24 and 25 of Mr. Pittman's testimony. On page 26, Mr. Price states:

I caliper every piece of every member when I am doing my own inspection, but not with a micrometer. I always caliper every section.



In connection with the way the operation affected the shop, Mr. Pittman states on page 26:

Well, the plates took up space at the lower end of the shop prior to the time that they were calipered and during the time that they were being calipered, and required to handle the plates the services of men that should have been employed otherwise in getting more output.

There is probably some justification for the complaint of the Contractor relative to the amount of calipering that was done on the material, but it can not be admitted by your committee that the contractor, under the terms of the contract, had a right in every instance to determine what should be done by the Isthmian Canal Commission's inspectors. This is a question that, from the very nature of it, must first have been decided by the Isthmian Canal Commission's inspectors. It is believed, however, by your committee that they carried this operation further than was justified.

*Wedges or fillers.*—The Contractor claims that these were unimportant members, and that he was required to do very fine machine work under the requirements of the inspectors. (See p. 43 of brief of Contractor.)

The principal part of the testimony in connection with the wedges or fillers is found at the following places: Mr. Reed, volume 10, pages 118, 121, 147 to 150; Mr. Price, volume 10, page 81; Mr. Pittman, volume 12, pages 31 to 37; Mr. Conley, volume 22, pages 17 and 18.

The Commission's inspectors insisted upon a limitation in the variation in the thickness shown on the drawing of not more than one-thirty-second inch. (See testimony of Mr. Pittman, p. 37.)

Some of the wedges were rejected because they were planed too thin; others were sent back for correction because they were planed too thick. The shop inspectors were not aware of the fact that the wedges were to be planed in the field. (For above statement, see testimony of Mr. Price, vol. 10, p. 81.)

In the list of rejections attached to the testimony of Mr. Price, Exhibit 4, there is a record of 6 fillers, C-158, D-158; rejected—one-fourth inch scant of required width. This rejection was made January 9, 1912. In the same list, contract 5749, replace material, there is a record of rejection of wedge DW 35 L, owing to not coming up to our requirements in weight or gauge. On May 3, 1912, there is a record as follows:

Rejection of 6 wedges 1-DW21<sup>R</sup>, 4-UW41<sup>R</sup>, 1-UW41<sup>L</sup>; gauge eleven-sixteenth inch instead of three-fourths inch as required. Wedges will not true up.

On August 16, 1912, there is a record of two wedges being rejected on account of being one-eighth inch short. (Contract 4863.)

These rejections would seem to indicate pretty clearly that under instructions of Mr. Hammer, the wedges were being made very accurately. The degree of this accuracy is shown fully on page 44 of the claimant's brief.

In view of the fact that most of these wedges were required to be replaned in the field, of which requirement the shop inspectors do not appear to have been aware (see testimony of Mr. Price, p. 81), the great accuracy demanded at the shop in making these wedges was unnecessary.

*Grinding rivet heads.*—Paragraph 38 of the specifications provides that:

All countersunk rivets shall be chipped smooth unless otherwise noted on drawings.

There were 1,113,814 countersunk rivet heads in the shop. (For a list of such rivets, see Exhibit No. 5 of Mr. Pittman's testimony, vol. 12.)

Under this specification the Commission's inspectors required the Contractor to chip rivets so that the head would be a little full and then grind them down where necessary. The usual practice is to chip the countersunk rivets so they will be slightly dished at the center of the rivet. This is the way the contractor construed the provision of paragraph 38 of the specifications, which required all countersunk rivets to be chipped smooth. Mr. Price, under direction of Mr. Hammer, construed the specifications requiring the head of countersunk rivet to be so chipped that it would entirely fill the countersink and be smooth with the surface. (See pp. 41 and 42 of the testimony of Mr. Pittman.) This grinding was done with emery wheels. (See testimony of Mr. Pittman, p. 42; for a full statement from Messrs. Price, Pittman, Sterrett, Wolfel, Reed, as to the grinding of these countersunk rivets, see pp. 37 to 51 of Mr. Pittman's testimony.)

Mr. Pittman estimates that four men were grinding most of the time. (See p. 50 of his testimony.) This estimate is undoubtedly too high, for the reason that the total expense for grinding on the lock-gate material was only \$872.47, which would be, on the tonnage of the lock-gate material, 1.62 cents per ton. There does not appear to be any charge for grinding the material from December, 1909, to November, 1910; and under the head of grinding from February, 1913, to February, 1914, there was a charge of \$20.13.

It is probable that a part of the high charge for chipping on the lock-gate material was due to the refinement in the requirements as to chipping the countersunk rivets. This will be considered under the heading of "Chipping and finishing."

There was some unnecessary grinding in connection with these countersunk rivets—there seems to be no doubt of that—but not to the extent as shown in the testimony of Mr. Pittman. This grinding probably also delayed the Contractor in other operations in connection with the production of the material for the lock gates.

Mr. Pittman was asked the following question:

Q. Would that delay the member in passing through the shop to any considerable extent?—A. Yes; it would. In the case of girders it would be necessary sometimes to hold the girder on the skids for grinding when it was otherwise ready to be run out on the scales.

Mr. PRICE. That is right. (See pp. 48 and 49 of Mr. Pittman's testimony.)

*Chipping and finishing.*—Paragraph 40 of the specifications provides:

All sheared edges and ends of material shall be planed off to a depth of three-sixteenths of an inch, or as much more as may be necessary to remove the sheared surface of the material. Where planing is not possible they must be neatly dressed by chipping.

Paragraph 41 of the specifications provides:

The edges of all plates and shapes which require to be calked for water-tightness must be either planed by machine or, where this is not feasible, chipped by hand in a fair line true to the dimensions to a bevel of about 15 degrees.



In the specifications of the New York Connecting Railway Co., paragraph 51, it is provided:

All shearing of shapes and bars shall be neatly and accurately done and all portions of the work exposed to view shall be neatly finished.

Paragraph 52 of this specification reads:

All sheared edges in plates in all material over one-half inch in thickness shall be planed off at least one-eighth inch.

In the specifications for the Quebec bridge, paragraph 93, it is provided:

All sheared edges shall be planed off at least one-eighth inch. All chipping, whether of rivets or other parts, shall be done in a neat, workmanlike manner, without breaking out of metal. Each chipped surface shall be finished off with a file. Where metal is chipped or planed out of a plate or shape all concave corners shall be rounded off to a radius of at least 2 inches unless shown otherwise on the plans.

Paragraph 94, same specifications, reads:

Rolled edges through which stresses are transmitted by bearing shall be treated like sheared edges.

The departmental shop-cost record furnished by the McClintic-Marshall Construction Co.—General Exhibit No. 26, volume 26, of the testimony—shows that the chipping on the lock-gate material cost \$14,255.32, or 26.43 cents per ton. The chipping on material passing through shop 2 for the period from December, 1909, to November, 1910, cost \$2,931.97, or about 7 cents a ton. The chipping on all material that passed through shop 2 from January, 1913, to February, 1914, inclusive, cost \$3,305.79, or about 8 cents per ton. The average cost of chipping for the two last periods was 7.53 cents a ton. This shows that the chipping on the lock-gate material cost 18.90 cents more a ton than the chipping on material for the year preceding and the year succeeding the fabrication of the lock-gate material. In other words, the chipping of the lock-gate material cost about three and one-half times as much per ton as the chipping on material that passed through shop 2 for the year preceding and the year succeeding the fabrication of the lock-gate material.

The quotations from the specifications above given indicate that the specifications under the lock-gate contract for these operations were more exacting than the specifications for the bridge work passing through shop 2.

As shown above, the great amount of chipping done on the countersunk rivets would account for a large part of the excess cost of chipping on the lock-gate material, but as shown in the testimony referred to above, under the heading of "Grinding rivet heads," the chipping must have been more expensive under the requirements that were made than it would have been if the Contractor had been allowed to chip under the usual practice. The fact that he was required to chip so accurately and leave the head of the countersunk rivet so flush that it would be necessary to do some grinding to make it smooth with the surface, indicates clearly that he was required to do this chipping with a great deal more care than he was required to do on the chipping of ordinary bridge work.

A part of the increased cost of chipping was undoubtedly due to the excessive refinements that the Commission's inspectors imposed upon the Contractor in connection with chipping the countersunk

rivets. There was also some unnecessary chipping and grinding on the manhole covers. (See testimony of Messrs. Pittman, Reed, Sterrett, Wolfel, and Price in testimony of Mr. Pittman, pp. 68 to 77.) This undoubtedly caused the Contractor some delay and some extra expense.

On page 67 of Mr. Pittman's testimony he states:

It was required that we do an unusual amount of chipping and grinding on parts other than countersunk rivets. We were required to chip a great many sharp edges and grind them to a slightly round edge. This applies to the plates, manhole covers, ends of girders, A frames, and various other small pieces.

In reply to a question of Mr. Sterrett, Mr. Pittman says:

It was required principally in order to make the finished work look neat. (See p. 67, Mr. Pittman's testimony.)

Authority for requiring this would be under paragraph 40, which provides that:

All sheared edges and ends of material shall be planed off to a depth of three-sixteenth inch, or as much more as may be necessary to remove the sheared surface of the material. Where planing is not possible they must be neatly dressed by chipping.

Mr. Pittman states that was an unusual requirement and not customary on other bridge and structural work.

The records of the McClintic-Marshall Construction Co., giving the departmental shop cost, sustain Mr. Pittman in this statement. Some of the chipping was probably unnecessary, but it does not seem to be fair to assume that no more chipping was required on this work than on the average work passing through shop 2 for the year preceding and the year succeeding the fabrication of the lock-gate material. The fact that there were 1,113,814 heads of countersunk rivets to be chipped in this work alone would indicate that there must have been much more chipping legitimately required on the lock-gate material than on all other work passing through shop 2 for the year preceding and the year succeeding the lock-gate period.

*Finishing.*—It is probable from the testimony that there was some unnecessary finishing done outside of the chipping that has been considered above. There is no specific item for finishing in the departmental shop cost records of the Contractor, but it would seem from the testimony and from the records as kept that most of the work of finishing must have been charged under the heading of "Chipping." Some of this work was undoubtedly done merely to improve the appearance of the structure. (See the testimony of Mr. Pittman, vol. 12, pp. 67 to 77, and testimony of Mr. Price, Mr. Reed, and Mr. Sterrett in connection with that of Mr. Pittman in that volume; also pp. 102 to 107, inclusive, 116 to 122, inclusive, and 124 of vol. 10.)

All of this cost the Contractor some more money and to a certain extent delayed the work.

*Vertical diaphragms and vertical frames.*—The vertical diaphragms consisted of the A frames and B frames, and the vertical frames consisted of the water-tight frames and the nonwater-tight frames. There were 2,804 A frames and 2,804 B frames in the 92 leaves, and in the spare parts there were 110 A frames and 110 B frames. There were 2,544 water-tight frames and 4,696 nonwater-tight frames in the 92 leaves and 96 water-tight and 168 nonwater-tight frames in the spare parts.



Paragraph 23 of the specifications provides the manner in which the vertical diaphragms shall be made. This paragraph is as follows:

The details of these are shown on drawings 5035 and 5036. The vertical sides and the top and the bottom surfaces are to be milled to the exact dimensions given on drawings, making a very close fit with the adjoining plates. Vertical diaphragms B in the bottom panel at quoin end of leaf must be made exactly as shown on the drawings and calked for water-tightness.

Paragraph 24 of the specifications describes the manner in which the vertical frames shall be made. This paragraph is as follows:

In each leaf there will be five transverse vertical frames built in between the horizontal girders and extending from the bottom to the top of the leaf, three of which must be made water-tight within the air chamber. In the bottom panel of each leaf one of the nonwater-tight frames is made water-tight for a pump chamber. Details of all vertical frames are given on drawing No. 5035. The nonwater-tight frames are to be constructed of a web plate having double flange angles at the top, bottom, and ends and two vertical and two horizontal stiffeners. Each frame will have a manhole cut in the web so that free access can be had to all parts of the leaf; in the two lower panels of the 77-foot, 79-foot, and 82-foot leaves there will be reinforcing plates around the openings for manholes in the web, while in the 47-foot 4-inch, 54-foot 8-inch, and 66-foot leaves frames in the lowest panel only will have their web reinforced at manholes.

The water-tight frames will be constructed similarly to the nonwater-tight frames, excepting that there will be no horizontal stiffeners and on one side the flange or bounding angles will be crimped over the flange angles on the horizontal girders. This crimping must be smithed in such a manner as to obtain a close fit of both of the bounding angles to the adjoining structural parts and insure good contact for calking. In no case will the use of steel shavings be permitted for filling openings where the crimping is poorly done. There will be a water-tight manhole in each frame, fitted up complete as detailed on plans. For sizes of material and riveting the typical detail plans must be exactly followed. The top and the bottom flange angles of all vertical frames shall be milled.

On June 26, 1911, Mr. Goldmark wrote Mr. Hammer, giving his idea as to the accuracy with which the diaphragms A should be made. (See Exhibit No. 1 in Mr. Pittman's testimony, vol. 12.) In this letter Mr. Goldmark stated:

Referring to my letter of June 23, with regard to getting the ends of diaphragm A and ends of webs in horizontal girders to line up flush, I went to Gatun to-day, and although I was unable to get about the ends of the girders much on account of my broken arm, I had a chance to see something of the fitting and discuss the matter at length with Mr. Gynn and Mr. Jewel. It appears that they were able to get a somewhat better line on these ends, but it is quite clear that if either the girders are too long or too short or the diaphragms are not exactly  $90^\circ$  at their intersection with the ends of the top and bottom surfaces it will be impossible to get a good job. I will ask you, therefore, to pay special attention to these two points. I think, with regard to diaphragms A, that it would be absolutely necessary to have a very accurate square of steel made and to test these corners in each and every diaphragm before accepting same, insisting on accuracy of fitting at least along the web of the diaphragm and angles just adjacent to be almost absolutely perfect, which there should be no difficulty in doing. If the vertical connection angles at the ends of the diaphragm spring in or out a little we can doubtless correct this error by drawing them up against the end plates during assembly.

In a letter to Mr. Hammer, dated June 23, 1911, Mr. Goldmark states:

Considerable trouble has been found in getting the ends of diaphragm A and the ends of webs in the horizontal girders to line up with each other flush. In some cases the girder's webs project; in others the diaphragms. The maximum difference is over one-sixteenth of an inch. This is a very important matter and I am writing you so that you may use every effort to obviate this trouble in the future. These diaphragms were inserted and brought forward so as to



be as nearly flush as possible with the webs. In other words, the discrepancies are not due mainly to errors in the rivet holes. I am inclined to think that they may be due to the following two causes, or to one of them, namely, the girders may not be of exactly the right length when finished. In the second place, the diaphragms may not be exactly  $90^\circ$  between the tops and vertical ends.

You can see that it is of the utmost importance to get great accuracy in this matter, as well as in the reaming out of the rivet holes for the connections which you are doing in the shop. I do not expect impossible accuracy in this or other matters, but the designs require a uniform bearing, both on the webs and on the diaphragms, and it is very slow process to grind out these variations in the field.

If you do not feel entirely satisfied with the placing of the rivet holes, you had better omit the shop reaming and have these holes reamed out in the field, though I should regret making this move.

In a letter to Mr. Hammer, dated June 22, 1911, Mr. Goldmark states:

One or two of the A-frame connections are very bad, although I have not seen these myself, having broken my arm lately, so that I am unable to climb up the steelwork.

In his testimony (pp. 49 to 52, vol. 8), Mr. Goldmark states:

A. Well, I understand that we required that the angles should be so nearly  $90^\circ$  that the difference in the length of the diaphragm or the height of the frame should not exceed one thirty-second of an inch—that I have from Mr. Price, that that was insisted upon.

Q. Was that insisted upon with your knowledge and under your directions?—

A. I am pretty sure it was; that that matter was taken up between Mr. Price and myself personally during one of my visits in Pittsburgh, the reason being that the gates had to be built up very accurately, and also that if the diaphragms stuck out at the end you would not build your end plate up truly, because the 24-inch end plate that has been discussed in connection with the grinding, had to rest upon and be riveted to these end diaphragms.

Now, in that case, it was important that the merged end of the horizontal girder and the end of the diaphragm A should match when they came together, and when you come to the next girder above that same A diaphragm had to match with the next girder, and the diaphragm above with that, and so on; and that is why that angle had to be very correct; and naturally, the rivets connecting the A diaphragms to the girders also had to be very accurate in their position in the girder and in their own individual spaces, or else, as happened in some cases, by bolting up the A diaphragm to the girders the A diaphragm stuck out into space, and it had to be ground off before you could attach the 24-inch end plate. And that is the reason, I think very properly, in the shop they insisted on very accurate holes and very accurate angles in the A diaphragm. But that is all.

I would also say in that connection that when Mr. Price and I went over those, they were insisting that the entire end angles——

Q. (Interposing.) Whom do you mean by "they"?—A. Mr. Price and the inspectors in direct charge were insisting that the planing should be done very accurately and were rejecting various A frames and having them corrected, until they got very accurate results in the A frame.

Q. Do the specifications indicate the degree of accuracy that was to be insisted upon in those frames?—A. They show them to be planed on all sides, if I am not mistaken, which would mean, I think, a great degree of accuracy, though I do not mean that is quite fair to say—I mean they could be planed, of course, to any angle.

Judge HARRAH. Do you make any special question of that, Mr. Wolfel?

Mr. WOLFEL. That is one of the points we are making.

Judge HARRAH. That is one of the points you are making, that there was too great a degree of accuracy required in the angles and the frames.

Mr. WOLFEL. One of the points we are making is that if extremely fine degrees of accuracy were required they should have been specified in the figures in the specifications.

Judge HARRAH. What I want to ask is, if you are making any point that the actual requirements as to these frames were unreasonable ones? Are you making that point now?



Mr. WOLFEL. There has been a good deal of trouble on the A frames, and I think you will find the people will claim the requirements were unnecessarily severe.

Mr. GOLDMARK. I think Mr. Wolfel yesterday, in connection with the holes, said he thought in those A frames we were justified in asking those to be correct within one thirty-second inch.

Mr. WOLFEL. I agree to that, Mr. Goldmark, in reference to the position of those holes toward the base end of the girder, or toward the planed end of the diaphragm that butts up against the end plates. That is the point.

Mr. GOLDMARK. Yes.

By Judge HARRAH:

Q. Mr. Goldmark, if the degree of accuracy that you have described here was actually insisted upon by the Isthmian Canal Commission's inspectors, would you regard that as an unreasonable requirement under the specifications as drawn?—A. No, sir; I should not. We expected the gates to be plumb, and we expected the A diaphragms to be in contact with the girders, and that was the only way of getting it. I suppose that would come under the general designation of first-class work; I do not know. I would like to say, however, that in the beginning of the work on the 77-foot leaf the A diaphragm was not accurate enough and gave a good deal of trouble in the erection; and I think it was to the advantage of the contractor to have those A frames very accurate, because they had to grind them off where they were not.

Mr. Price, in his report (p. 7, vol. 3, of the testimony) considering the diaphragms A and water-tight frames WF, states:

Diaphragms A and water-tight frames WF were much more important members, and the limits of allowance were much more closely defined. Diaphragm A (Circular 576) required to be "milled on the vertical sides, and the top and bottom surfaces to the exact dimensions given on the drawings." The limit of variation from a true square was placed at one thirty-second inch by Mr. Hammer, which, considering the necessity for accurate work, was reasonable. This was the theoretical limit, but it is possible that this limit was stretched enough to reach three sixty-fourths inch at times when all other conditions were favorable.

That the inspection was not unreasonable and that the limit of one thirty-second inch was not too refined is demonstrated by the unsatisfactory condition of a number of these A frames when erected in the leaves on the Isthmus, as shown in letters of June 22, 23, and 26, 1911, from Mr. Goldmark to Mr. Hammer, file 64. In a letter to the chief inspector, dated July 13, 1911, file 117-1, Mr. Hammer refers to Mr. Goldmark's letter, and in the final paragraph states that "no inaccuracies should be tolerated in regard to the squareness of the A frames."

I quote from my letter to Mr. Hammer, dated August 11, 1911, file 117-1:

"A number of A frames have been held up by Mr. Wheatcroft on account of not being exactly square. I personally examined 10 of these frames to check up this defect, using a large steelsquare 5 by 4 feet, and found all to be out of square a certain amount, from one thirty-second to one sixty-fourth inch."

In my report to Mr. Hammer, dated July 17, 1911, file 70-2, I find this statement relative to condition of A frames:

"We have found in many cases the milling to be much rougher than is usual in first-class work."

Diaphragm A was not only one of the most important members in the lock gates, but it was a specially difficult member to assemble and mill within the required limits, one-sixteenth inch only on each side being allowed to true up to perfect square. Many corrections were made on these frames during the process of manufacture. Flange and connecting angles were rejected, also several web plates, but I have no record of any entire member having been rejected.

The limit of allowance for the water-tight frames was more liberal than that required for the A frames. Variations to be not more than one thirty-second inch or less than one-sixteenth inch from the dimensions for height as shown on drawings, and plus or minus one-sixteenth inch for width. Except during certain periods, these frames required only minor corrections.

That, according to my interpretation of the specifications and drawings, I considered it necessary for accuracy is shown in my report to Mr. Hammer,



August 1, 1911, file 117-1: "The work is in many cases intricate and requires careful inspection."

That accurate workmanship was required is stated in the contract, page 6, article 111:

"It is further understood, covenanted, and agreed that all material and workmanship used and applied under this contract, in detail and finish, shall be first class and of the very best quality."

That the inspection was close in certain instances must be admitted, but it must be understood that the particular character of the work required it. Special attention was paid to the accuracy of the work on diaphragms **A**, and to the spacing of the holes in the girders for diaphragm **A** connections, and also length of girder and spacing of holes for sheathing.

Special attention was also given to the water-tight frames. Each was made up of a continuous angle which was required to bear on the up-and-down-stream sheathing plates and webs of girders, and to crimp around the riveted and outstanding legs of the chord angles, and to fit close enough to calk for water-tightness."

Mr. Goldmark's testimony and the letters quoted above give a very clear idea as to the accuracy he considered to be necessary for the fabrication of the **A** frames. The quotation from Mr. Price's report gives a pretty accurate statement of the requirements made on the Contractor in an endeavor to carry out the specifications as interpreted by Mr. Goldmark.

In the testimony of Mr. Wheatcroft, who inspected most of the **A** frames, he gives his understanding as to the way he was to do this inspecting under his instructions. (See p. 4, vol. 13.) This statement is quoted below:

My instructions through my chief were that these **A** frames were to be practically as near perfect as they could be made, with a limitation attached to those instructions of one-eighth inch on the top angles and one-eighth inch on the bottom angles, one-eighth inch on the front angles and practically no limitation on the rear, which was an angle of unimportance that we did not care much about. These frames were to be within one thirty-second inch in height to the estimated height. In the width of the **A** frame we allowed them to go as far as one-fourth inch—being unimportant, on account of an unimportant **B** frame put up against it. The front end of this **A** frame must be absolutely correct to bear with the horizontal girders adjacent to it.

The details in connection with the way in which Mr. Wheatcroft carried on the inspection of the **A** frames and what he required in connection with the **A** frames are found on pages 5 to 33, inclusive, of his testimony, volume 13.

The testimony of Mr. Wheatcroft shows that these **A** frames were subjected to a very close inspection and that corrections were required in a great many of them. This fact is clearly established by the testimony above referred to, and by an inspection of Mr. Wheatcroft's shop reports and the notes contained therein.

Mr. Price was present at the taking of this testimony, also Mr. Sterrett, Mr. Wolfel, and Mr. Reed, and the subject as to what was required was pretty thoroughly covered.

An examination of the shop books of Mr. Wheatcroft shows that he was adhering very closely to the limitations that had been imposed as to the accuracy with which the diaphragms **A** should be made. Mr. Wheatcroft's shop books contained very frequent notes of the **A** frames having thin angles or slotted holes.

It also appears from the testimony of Mr. Wheatcroft (pp. 63 and 64) that Mr. Goldmark severely criticized the character of the work that had been done on the **A** frames on the first contract, and stated



that no more work of that character would be permitted in the lock-gate leaves, and insisted that the work should be more perfect.

Mr. Reed thinks that at that time there were about 200 of these frames piled up in the yard. (See p. 66 of Mr. Wheatcroft's testimony.) He also states that he asked Mr. Goldmark how far he could go on them, and the answer that Mr. Goldmark gave was, "We want the best that can be got." He states, "That is the answer that Mr. Goldmark gave at that time."

Mr. Wolfel entered into an agreement with Mr. Hammer under date of October 27, 1910, as follows (see Exhibit 17 in the testimony of Mr. Wolfel, vol. No. 7):

MITERING LOCK GATES, ISTHMIAN CANAL COMMISSION.

The following agreement has been reached in reference to the height of the various members in the leaf, so as to provide for vertical adjustment:

(1) *The water-tight frames* will be milled one-sixteenth inch shorter than the theoretical height.

(2) *The nonwater-tight frames* will be milled three thirty-seconds inch shorter than the theoretical height and one-sixteenth inch fillers used where necessary.

(3) *Diaphragms A and B* will be milled three thirty-seconds inch shorter than the theoretical height. In order to provide adjustment in case the reinforcing plates and the webs on the horizontal girders should pack out more than is anticipated, these diaphragms will be milled about one-fourth inch short in every fourth panel.

(4) *The end reaction castings* will be milled one thirty-second inch shorter than the height of the panel, and in order to guard against increase in height they will be milled one-fourth inch shorter than the height of the panel in every fourth panel.

(5) *The splice plates on the skin* will be made one-sixteenth inch shorter than the theoretical distance between cover plates, the intention being to grind some of these plates off in the field in case it should be found necessary.

(6) *In the doubling plates at the ends of the leaf* additional splices will be provided, so as to make them run over about four panels; and in order to insure a tight joint at the splice some of these plates will be made a trifle long and ground off in the field if found necessary.

(7) *The vertical end plates* will be made in lengths of about four panels. They will be cut about 1 foot 6 inches above and below the joint of the bent plates and a short plate used, which plate will be made a trifle long and ground off in the field, so as to insure joints.

(8) *The built-up intercostals which occur at the ends of the leaf* will be made one-eighth inch shorter than the theoretical length, and one-sixteenth inch fillers used where necessary.

This agreement is subject to revision after the first leaf has been assembled here.

Braddock, Pa., October 27, 1910.

PAUL L. WOLFEL, *Chief Engineer*,  
McCLINTIC-MARSHALL CONSTRUCTION CO.

Approved:

J. HAMMER,  
*Assistant Engineer, Isthmian Canal Commission.*

It is claimed by the Contractor that in view of this agreement the close limitations that were imposed as to height of diaphragms were unnecessary. (See claimant's brief, p. 47.)

An examination of the shop books of Mr. Wheatcroft, who inspected most of these A frames, shows that a great many of them were corrected—that in many cases the angles were reported as thin, although there does not appear to have been but very few rejections on this account. In other cases they were reported as being out of square and corrections were required; in other cases oblong holes were reported.

The testimony of Mr. Price, volume 10, pages 36 to 38, quoted below, gives an accurate statement as to what took place in connection with the correction of the angles on the A frames:

Mr. MARSHALL. I have always thought the excessive amount of work on the A frames was due to the inaccuracies of the commercial material which we received from the mills; especially on heavy angles it is very hard to get them at right angles. It is very hard to get these surfaces true surfaces. When assembling this material it was impossible to get perfect contact and perfect alignment; and in order to correct those inaccuracies it required an excessive amount of planing. It cost a large amount of rejections on account of this material not assembling in perfect contact. One of the very expensive parts of this work was the A frames and the B frames in the shop, and it was largely due to those causes.

Mr. PRICE. That is right. That is what I spoke of, about those angles being straightened.

Judge HARRAH. I would like that sketch to go in as an exhibit in connection with Mr. Marshall's statement.

(The sketch referred to was marked "Exhibit No. 3, Price.")

Judge HARRAH (continuing). Mr. Marshall, do you think the inspectors required greater perfection in the fit and finish of those A frames and angles than ought to have been required in first-class workmanship?

Mr. MARSHALL. I do; yes, sir. Those particular parts were finished with the accuracy of requirement of a machine-shop job.

Judge HARRAH. You were required to do that?

Mr. MARSHALL. Yes, sir.

By Judge HARRAH:

Q. Mr. Price, I will get you to state what was required on those angles and end plates that Mr. Marshall has pointed out under Exhibit 3.—A. One of the conditions that I have spoken about is shown on the sketch of Mr. Marshall; one angle is out of square; that is an acute angle; the other angle is fairly square. The heels of both angles are on a line with the end of the web plate. In milling the A frame on the end of the A frame facing the bent plate to true up, the angle which is out of square will necessarily take off more material on the angle on the opposite side, and also on the heel of the angle which is out of square, than would be allowed by the variation that we had in the specifications as to the thickness of the flanges. Is that clear?

Mr. MARSHALL. I think the rest of us thoroughly understand it; but whether some person not familiar with shop practice will understand it or not, I do not know.

By Judge HARRAH:

Q. What are the variations provided for in the specifications for the ultimate thickness of the flanges?—A. That takes in a general clause. If we call, for instance, for a half-inch angle, we would not accept a seven-sixteenths-inch angle. But we were allowed, as I remember it, one-sixteenth inch below what was called for in the drawings.

Q. Then if it became necessary to true up that angle to cut off the material so that it would be less than one-sixteenth inch below what was called for in the specification, you would take that as a cause for rejection?—A. For cutting that angle out; yes.

Q. Did you regard that limitation as essential to secure first-class workmanship in connection with that?—A. I certainly did. I think that was a liberal allowance—one-sixteenth inch.

Q. Was there very much trouble in the shop in getting those angles right to your requirements?—A. Yes; very considerable. I notice that there is mentioned in the shop book a number of times "thin angle" and a number of notes where I have repeated it. It does not state in the book I have mentioned or in the Wheatcroft book, that the angles were cut off for that reason. It mentioned that they were thin—probably either up to or past the limit allowed.

At the time Mr. Goldmark was at the works of the McClintic-Marshall Construction Co., in April, 1911, there were about 200 A frames in the yard pile one on another, which had not at that time been given a close, detailed inspection. (See testimony of Mr. Wheatcroft, vol. 13, p. 66.)



Mr. Crane objected to the angles on the **A** frames. (See his testimony, pp. 31, 32, 33, 34, and 35, and sketch prepared to illustrate his testimony, Exhibit No. 6—all in vol. No. 5.)

The objection of Mr. Crane to the angles on **A** frames was that they did not seat properly against the web and in correcting them the contractor used a sledge hammer to batter down the excess material on the web plate into the openings between the angles and the web plates. (See sketch, Exhibit No. 6, referred to above.)

Subsequent to May 24, 1911, Mr. Wheatcroft inspected nearly all of the **A** frames. The rate at which the **A** frames apparently were fabricated and inspected is approximately shown in the table below:

	Number of <b>A</b> frames.
May 24 to 31, 1911-----	15
June 1 to 5, 1911-----	113
June 6 to 17, 1911-----	103
June 17 to July 11, 1911-----	106
July 12 to 31, 1911-----	116
Aug. 1 to 18, 1911-----	104
Aug. 21 to Sept. 1, 1911-----	102
Sept. 2 to 22, 1911-----	110
Sept. 23 to Oct. 10, 1911-----	102
Oct. 10 to Nov. 1, 1911-----	105
Nov. 2 to 23, 1911-----	106
Nov. 24, 1911, to Jan. 1, 1912-----	110
Jan. 1 to 15, 1912-----	105
Jan. 15 to 27, 1912-----	68
Jan. 28 to Feb. 16, 1912-----	107
Feb. 16 to Mar. 5, 1912-----	104
Mar. 5 to Apr. 17, 1912-----	101
Apr. 18 to May 10, 1912-----	109
May 11 to June 6, 1912-----	101
June 7 to 23, 1912-----	102
June 23 to Sept. 16, 1912-----	103
Sept. 16 to Oct. 11, 1912-----	104
Oct. 11 to Nov. 5, 1912-----	102
Nov. 5 to 29, 1912-----	101
Nov. 30, 1912, to Jan. 8, 1913-----	113
Jan. 9 to Feb. 4, 1913-----	103
Feb. 5 to 25, 1913-----	68
Total-----	2, 683

As to the **A** frames inspected by Mr. Wheatcroft, there is a record as to the condition of each one of them where there was anything unusual.

Mr. Wheatcroft's shop books covering the period from February, 1911, to January, 1913, have been examined, and from these records it appears that of the 2,683 **A** frames of which there is a record, approximately 2,250 were passed without any notation of any defects whatever. Notations were made as to defects on approximately 400, but many of these were passed without correction, some of them were held up by Mr. Wheatcroft and subsequently passed by Mr. Price or Mr. Hammer. A good many others were sent back to the shop for correction, and the pieces of some of the **A** frames were required to be cut off and replaced.

On May 24, 1911, out of 5 **A** frames inspected, there is a notation that 1 **A** frame contained 10 slotted holes.

On May 31, 1911, Mr. Wheatcroft appears to have inspected 8 **A** frames and passed them all without question.

On June 1, 1911, Mr. Wheatcroft's shop books show 33 **A** frames inspected. Five rivets were cut out of these, two holes plugged, and one sent to shop to have top angle raised one-sixteenth inch.

On June 2, 1911, there was a report of 49 **A** frames inspected by Mr. Wheatcroft, with the following notations: Replace one angle, account of round back. Straighten one angle. Six frames were to be corrected by raising the angle one-sixteenth inch. On one angle a  $3\frac{1}{2}$ -inch hole for yoke pin was to be chipped out, and on one angle there was an open seam.

On June 3, 1911, eight **A** frames were inspected and sent back to shop to have the angle at bottom raised one-sixteenth inch and angle at top raised one-sixteenth inch.

On June 5, 1911, 25 **A** frames were inspected. Three were sent back to the shop; 1 to have angle raised one-sixteenth inch, 1 account of front angle being short, and 1 to have bottom angle raised one-sixteenth inch. All of these corrections were O. K'd by Mr. Hammer.

On June 6, 1911, 32 frames were inspected—7 to be corrected, as follows: One had a  $3\frac{1}{2}$ -inch hole cut in top angle for yoke pin. Three frames had front angle short one-sixteenth inch. One frame had wide seam in the front angle. One frame had front angle ruined—sent to shop for new set. In one frame there were four rivets to be replaced.

On June 10, 1911, six **A** frames were inspected; two were to be corrected. A 20 **R B** clips replaced because holes were out one-fourth inch. A-8 sent back to have four holes countersunk.

On June 12, 1911, eight **A** frames were inspected. One sent to shop to have the top bars and short front angle cut off because of oblong holes. A-20 sent to shop to cut off the bottom angle, account of oblong holes.

These are fair samples of the notes that run all through the record kept by Mr. Wheatcroft, with the exception that it appears that most of the corrections were made in the early part of the work. Although along in the latter part of 1911 and the first part of 1912 a good many angles were held up, some of them passed without corrections and some of them corrected. (See memorandum prepared by Judge Harrah, giving notes taken from shop books of Mr. Walter P. Wheatcroft, from June 1, 1911, to Feb. 25, 1913, relative to **A** frames.)

It seems that the estimate of the Contractor that 20 per cent of these **A** frames had to be corrected is entirely too high. The notations made by Mr. Wheatcroft in his shop books at the time would seem to be the best evidence as to the number of corrections that were actually made on these **A** frames, and from these notations not more than 10 per cent could have been corrected—possibly less than that.

There were 2,804 **B** frames in the 92 leaves and 110 in the spare parts. The specifications require that the vertical diaphragms **B** in the bottom panel at quoin end of leaf must be made exactly as shown on the drawings and calked for water-tightness.

The **B** diaphragms were made very much like, and inspected in practically the same way, as the **A** diaphragms, although there are not so many corrections required in these diaphragms as there were in the **A** diaphragms.



Some of the notations contained in the shop books of Mr. Wheatcroft from June 1, 1911, to January 27, 1912 (shop book No. 2), are given below:

July 14, 1911: Seventy-six **B** frames inspected—following notations: B-35, top clip low; B-43, jig out one-fourth inch, 2 pieces; B-43, top clip low; B-16, small bevel angles unfair; B-15, jig holes three-sixteenths inch out; B-2, large bevel, holes out in two pieces; B-2, jig holes out one-fourth inch; B-35, small bevel angles to cut off; B-16-L, top angle low.

July 20, 1911: Fifty-three **B** frames inspected. B-24, jig hole out one-fourth inch; 13 pieces sent to shop for attention; 8 pieces returned O. K. September 12; 2 pieces September 15, and 1 piece September 22.

July 29, 1911: Fifteen **B** frames inspected. B-24 sent to shops, jig holes at top angle; B-45, four holes plugged in each frame; 7 frames passed O. K.

October 5, 1911: Thirty-eight **B** frames inspected. B-42, top angle low, O. K.; B-42-R, top angle low, O. K.; B-45-L, top angle low, O. K.; B-29-R, top angle low, O. K.; B-43-R, bevel angle holes too close for gauge—same as to 5-L, each O. K. Eighteen countersink bottom angles.

November 27, 1911: Ten **B** frames inspected. B-24, 3 pieces bad holes, short bevel angles cut off; B-27, bad holes, end clips cut off.

The number of **B** frames inspected during this period (June 1, 1911, to Jan. 27, 1912) was 1,262.

The notations in the shop books show that corrections and rejections of the **B** frames were similar in character to those for the **A** frames. It is, therefore, not considered necessary to give the same details as to corrections made on the **B** frames as has been given on the **A** frames.

Testimony other than that referred to above in connection with the **A** frames, which would apply also to the **B** frames, may be found at the following places:

In Mr. Pittman's testimony, volume 12, pages 77 to 96, 119, 120, 165, 166, and 185.

In Mr. Reed's testimony, volume 10, pages 107 to 112.

In Mr. Crane's testimony, volume 5, pages 31 to 34 and 67.

In Mr. Price's testimony, volume 10, pages 5, 36 to 38 and 82.

In Mr. Wagoner's testimony, volume 19, pages 98, 119, and 123.

In Mr. Wheatcroft's testimony, volume 13, pages 4 to 33, 64 to 67.

In Mr. Harber's testimony, volume 18, pages 20 to 29 and 32 to 34.

In Mr. Williams's testimony, volume 14, page 5.

In Mr. Neeld's testimony, volume 23, page 57.

There were not as many corrections made in the **B** frames as there were in the **A** frames.

*Vertical frames.*—The vertical frames consist of diaphragms, water-tight, mark WF; 2,544 on the 92 leaves, and 96 for spare parts; also diaphragms, nonwater-tight, mark CF; total, 4,696 on the 92 leaves, and 168 for spare parts.

Under the original design the water-tight frames consisted of a web plate, with a so-called "bounding angle" around the edge. The frames were made to fit in between two adjacent girders and the sheathing. The "bounding angle" was required to be "crimped"



at each corner to fit around the projecting girder angles. The contract drawings showed each "bounding angle" to be made up of four pieces; the ends of the four pieces being cut to 45 degrees bevel. These joints were intended to come, one on each side of the water-tight frame at a point not far from the center. It was intended that the four pieces of angle be cut to exact bevel and length, so that after assembling and riveting they would be in close and perfect contact throughout, and the joints could be caulked. (See exhibit 26 in Mr. Pendergrass's testimony, vol. 15, also for drawing showing full-size detail of cut in staple angle for water-tight frames see Exhibit No. 24 in Pendergrass's testimony.)

It was not practicable; in fact, it was almost impossible to make the bounding angle water-tight as originally designed. (See testimony of Mr. Wheatcroft, pp. 36, 37, 38, 39, and 40; also testimony of Mr. Pendergrass, pp. 64 to 65; see also statement of Mr. Nutting filed in "Miscellaneous data.")

After expensive experiments in attempting to make the water-tight frames with the bounding angle, as originally designed, that design was abandoned. The water-tight frames as manufactured had bounding angles, same as originally proposed, except that the bounding angle for each frame was welded into one piece, making a bounding angle of the required dimensions before being assembled and riveted.

It is claimed by the contractor that this was a more expensive way of making the bounding angle for the water-tight frame than that shown in the original design. The question as to the increased expense in making this angle in this way will be considered separately hereafter under special consideration of claims for changes not covered by the agreement of August 8, 1910. This claim will be considered under C-8 Appendix, page 31 of original claim.

The rate at which the water-tight frames were produced from June 2, 1911, to February 25, 1913, as taken from the shop books of Mr. Wheatcroft, is shown in the table below:

	Number inspected.
June 2, 1911, to July 15, 1911-----	109
July 16 to 20, 1911-----	115
July 21 to 24, 1911-----	95
July 25 to 27, 1911-----	109
July 28, 1911, to Aug. 17, 1911-----	93
Aug. 18 to 22, 1911-----	172
Aug. 23 to 28, 1911-----	91
Aug. 29, 1911, to Sept. 19, 1911-----	96
Sept. 20 to Oct. 9, 1911-----	110
Oct. 10 to 23, 1911-----	114
Oct. 24, 1911, to Feb. 1, 1912-----	94
Feb. 2, 1912, to May 2, 1912-----	322
May 3 to 25, 1912-----	102
May 26, 1912, to July 1, 1912-----	100
July 2, 1912, to Aug. 14, 1912-----	102
Aug. 15 to 30, 1912-----	100
Aug. 31, 1912, to Sept. 6, 1912-----	27

The principal corrections required in the water-tight frames and the reasons why they were required are shown on pages 35, 41, 42, 43, 44, 45, and 46 of Mr. Wheatcroft's testimony. (See Exhibit No. 1 and Exhibit No. 2 in Wheatcroft's testimony and explanations on pages of testimony above referred to.)



As to the corrections made in the nonwater-tight frames, see page 47 of Mr. Wheatcroft's testimony, volume 13. The principal corrections in these frames appears to have been on account of bad holes. Sometimes where the frames were excessively high the angles were removed and riveted back where they belonged. (See p. 47 of Mr. Wheatcroft's testimony.)

*Footwalk frames.*—The footwalk frames were small, angular frames that were to be filled with concrete on the Isthmus and used for footwalks on top of the gates. There were approximately 2,840 of them required. The Commission's drawings allowed but one-eighth-inch clearance between the frames, and if they were out of square more than one-eighth inch they had to be corrected. (See testimony of Mr. Pitman, p. 54, vol. 12.)

The Contractor claims that this small clearance in the original drawings was entirely unnecessary, and that they should have been allowed to build the frames smaller so as to have more clearance between the frames when put in place. They were required to build the frames of the sizes called for on the drawings, and under this requirement they had great difficulty in keeping the frames to the exact dimension and squareness required. (See p. 54 of Mr. Pittman's testimony.) In riveting the frames they were spread the least bit at the corner, and this would frequently throw them out more than one-eighth inch, the amount allowed. In order to avoid this, jig frames were built into which the sidewalk frames were fitted before the rivets were driven. The purpose of the jig was to hold the sidewalk frames to the exact size. (See p. 54 of Mr. Pittman's testimony.)

It was necessary that the frames should be so square and so exact in size that when placed in position they would not overrun in length on the leaf. It was also necessary that they should have proper bearing when they were in position, so that they would not rock. It seems, however, that the Contractor had a right to believe that he would be allowed to adopt his ordinary methods in making these frames, and that if necessary he would be allowed a reasonable variation from the exact size shown on the drawing so long as this variation did not result in making the frames of the walk unsightly. The testimony also shows that in many instances the frames were bent and twisted in shipping, and had to be corrected after they reached the Isthmus, so that it would appear that the extreme squareness and accuracy in which these frames were required to be built in the shop was unnecessary. The evidence shows that this excessive accuracy in building the sidewalk frames and brackets cost the Contractor some money, and to some extent delayed the execution of the work. The amount to be allowed on this account can hardly be stated in dollars and cents as a separate item, but will be taken care of in connection with the general allowance made in claim 2.

*Rusting and pitting.*—The contractor claims that there was an unnecessary amount of material rejected on account of rusting and pitting during the course of manufacture. Paragraph 58 of the specifications provides that:

Material may be rejected at any stage of manufacture, fabrication, and erection for surface or other injurious defects, either previously existing or developed in working, although it bears the above-mentioned stamp, and shall be replaced by the Contractor at his own cost for material and labor.



Paragraph 78 of the specifications provides that:

Plates and shapes must be free from slag, foreign substances, brittleness, hard spots, laminations, sand or scale marks, snakes, pits, and defects generally.

The records of the shop inspectors show that rejections were made as follows for rust pits:

4865. 1 bent plate, BP 17 L, owing to deep rust pits on each side_____	1, 600
4855. 1 bent plate, BP 17 R, on account of rust scales and rust pits.	
Sand blasting did not improve condition_____	1, 600
4855. 5 splice plates, S 24, rust pits_____	620
8 splice plates, 24 A, rust pits_____	992
4855. Footwalk filler and splice plates, 25 pieces minor parts_____	1, 100
4863. 1 bent plate, BP 23, owing to rust pits_____	2, 800
11 wedges, UW 3 25_____	375
1 26_____	120
1 42_____	150
1 44_____	125
3 8_____	330
2 32_____	250
	1, 350
90 bent plates, owing to rust pits_____	65, 055
2 doubling plates rejected owing to rust pits—	
DP 52 R, owing to rust pits_____	2, 700
DP 2 R, owing to rust pits_____	3, 275
	5, 975
4863. 5 footwalk brackets, PW 19-21-21A, owing to rust pits_____	635
2 chord angles, 6 by 3½ by ½_____	1, 530
1 chord angle, 6 by 3½ by 7/16_____	675
(Owing to corrosion and rust pits.)	
4873. Bent plate, BP 24 R, owing to rust pits_____	580
	84, 512

In the brief of the Contractor, page 50, it is stated:

The rejection of a small piece of a finished member in a shop can be very annoying and cause great delay and expense. With the great number of inspectors that the Commission had, if they were attending to their work, it is certainly inexcusable on their part to allow this material to be riveted into place if they intended to have it rejected. The cost of the material rejected might be very small, but the cost of cutting it out and replacing it with other material, considering the delay of holding the finished member in the shop until the work was done, would be very great.

There is no doubt that it would be annoying and expensive to cut out small pieces of finished members in the shop. There is no question from the evidence but what in some cases this was done. It was, however, the duty of the Contractor, under the terms of his contract, to put only first-class material in the work. He can not be allowed to escape this duty on the assumption that the Commission's inspectors should have observed that he was attempting to put material in the work that had been injured by rust pitting and stopped him from doing it. Such a position is entirely untenable. The question as to whether the material was injured by rust pitting at the time it was rejected is one that was necessarily left to the judgment of the Isthmian Canal Commission's inspectors, and the whole question in this case as to the rejection of material for rust is one as to whether the Isthmian Canal Commission's inspectors exercised an honest and fair judgment upon the facts as they saw them, or as to whether or not they were mistaken as to the extent to which the material was injured by rust pitting.



The following material appears to have been rejected, due to rust pitting:

On Aug. 21, 1912:

	Pounds.
7 sheathing plates-----	15,720
2 sheathing plates-----	4,500
13 bent plates-----	7,450
32 wedges-----	8,670
1 web plate-----	610
On Sept. 11, 1912:	
4 sheathing plates-----	5,180
1 web plate-----	360
36 wedges-----	9,950
159 frame angles-----	3,430
On Oct. 7, 1912:	
7 fillers-----	105
3 footwalk angles-----	200
Total rejected, due to rust pitting-----	56,175

These rejections do not appear to have been applied to any particular contract, and it is assumed that no work had been done on the material at the time of rejection, except the bent plates, which were bent at the mill before they were sent to the shop.

The total amount of material rejected on account of rust pitting, of which there appears to be a record, was 140,687 pounds. In this amount there were 107 bent plates weighing 79,085 pounds.

On July 16, 1912, Mr. Hammer gave instructions as follows:

Confirming verbal instructions given you previously, you are advised to reject all material badly corroded or pitted, as only first-class material, free from rust or pit marks must be used for our work. (See Mr. Pittman's testimony, p. 99.)

The testimony in connection with the rejection of material for rust pitting is found in volume 12 of Mr. Pittman's testimony, pages 96 to 115, 132, and 133; Mr. Reed's testimony, volume 10, pages 150 to 159; Mr. Wagoner's testimony, volume 19, pages 119 to 120; Mr. Johnson's testimony, pages 102 to 104, volume 17; and Mr. Marshall's testimony, volume 11, page 18.

The contention of the Contractor is that in much of the material the rusting did not constitute an injurious defect. It is claimed by several of the inspectors of the Isthmian Canal Commission that when rust pitting once begins that there is no way of stopping it. (See testimony of Mr. Wheatcroft on p. 106 of the testimony of Mr. Pittman, vol. 12.) It is claimed by the Contractor, however, that where the material is thoroughly protected after it has been placed in the work, that there is no danger of the rust pitting continuing through the material. (See pp. 109 and 110, vol. 12 of the testimony.)

Mr. Sterrett, on page 108 of Mr. Pittman's testimony, volume 12, states:

Now, you know the whole contention in connection with the rejection of these bent plates is that the material should have been accepted because it was not exposed.

This statement was addressed to Mr. Wheatcroft in the form of a question. Mr. Wheatcroft's reply was:

My experience is that the exposed metal goes—under water it is all right.

The testimony also shows that at the time the question of rejection first came up the plates were sand-blasted and then carefully measured by the Contractor with micrometers, and there was no appreciable decrease in the thickness.

The whole question as to whether these bent plates should have been rejected is one of judgment between the Isthmian Canal Commission's inspectors and engineers and the Contractor's engineers and inspectors. The reason why it was particularly injurious to the Contractor to have all bent plates rejected is stated by Mr. Pittman on page 97 of his testimony, volume 12, as follows:

There were 40 tons of the end bent plates that were rejected and had to be replaced. That 40 tons of material also was rather expensive, inasmuch as it represented not only the cost of the material but the cost of the bending at Homestead on the armor-plate press. The plates that were rejected were all bent; so that we had a considerable investment in them, besides the material.

On page 96 of his testimony, Mr. Pittman states that:

It was necessary for us to order all of these plates for the entire 92 leaves at one time, when the work was first started, owing to the fact that they were made in the armor-plate plant at Homestead, from dies which were built for the purpose; and when the dies were once put in it was, of course, the desire at Homestead to do all of the work at one time and thus avoid putting in the dies a second or third time.

Mr. Pittman further states (p. 96):

During the interval of the time when these end bent plates were first rolled and the time that the last of them were used in the shop they became rusty and the inspector rejected a large number of them on this account.

Mr. Wolfel made a very careful examination of these plates at the time, and he was of the decided opinion that they were not injured from rusting. Mr. Wolfel's statement is found on page 103 of Mr. Pittman's testimony, volume 12, and is as follows:

Well, I looked at that material, together with Mr. Hammer and Mr. Price, after it was thoroughly sand-blasted, and I told them then that I would not hesitate a minute to take the material. In fact I told Mr. Hammer that it was a perfect sin to throw it out.

Now, this applies the more so in this case, because in the leaves that material is either confined between other material or it is covered with bitumastic enamel. Now, if rusting is to continue, there must be exposure, there must be air, or moisture, or water; and neither air, nor moisture, nor water could get at this material because it was either confined between other plates and castings or it was covered with bitumastic enamel.

Further statements of Mr. Wolfel in connection with this can be found on page 104 of volume 12 of the testimony.

The testimony of Harry M. Johnson, relative to the rejection of material for rust pitting, is found in volume 17, pages 96 to 104, inclusive. Mr. Johnson saw some bent plates in the latter part of 1911, which he thinks were pitted one-eighth inch deep. Mr. Price thinks that they were one-sixteenth inch, probably more. (See p. 104, testimony of Mr. Johnson and others, vol. 17.) Mr. Wolfel states (same reference to testimony):

If the plates had had pits the full one-sixteenth inch I would not have asked for their inspection. I would not have asked for inspection on plates with pits one-sixteenth inch deep. I should think those pits would be one thirty-second inch. You know one thirty-second inch pit is quite noticeable, and one-sixteenth inch would be more so.

The inspection of material for rust pitting after the letter of Mr. Hammer, of July 16, 1912, was very exacting, and, in some instances,



it was probably unreasonably so. When material had been used and placed in a finished member, the inspectors should have been very sure that it was pitted to such an extent that it would be injurious to the material before it was rejected.

In view of the circumstances surrounding the rejection of the bent plates, your committee is inclined to give the benefit of the doubt in this transaction to the Contractor. This is done for the reason that the evidence shows that these plates would not be exposed after they were placed in the work, and the weight of the testimony seems to be that if the material is not exposed the pitting will not continue.

The rejection of material for rust pitting did delay the work of fabrication in the shop to some extent and caused the Contractor increased expense. Some of this increased cost was caused by the Contractor leaving the material in an exposed condition after it was purchased, knowing that it would possibly be three or four months and probably longer before the material would be used, notably the bent plates.

Any allowance that may be authorized for material rejected on account of rust pitting will be made under claim 3.

*Turned bolts.*—Paragraph 34 of the specifications provides that:

All bolts connecting heel, pintle, and end reaction castings to the leaf shall be turned to a driving fit; the holes in the riveted structural parts must be reamed or drilled in the field to insure perfect fitting. Heads and nuts shall be hexagonal and finished on faces touching plates. All threads shall be United States standard. Where necessary for water-tightness, the heads and nuts shall be calked or other provisions made by means of lead washers, etc., for preventing the entrance of water.

The contractor bought a 2-inch triple bolt cutter with milling attachment to make these bolts. (See letter of Mr. Neeld of Nov. 15, 1910; also list of "Panama shop equipment" purchased, quoted on p. 38 of this report, found in vol. 27 of the evidence.) Some of the bolts were manufactured by the McClintic-Marshall Construction Co. in the early part of the work, passed by the inspectors, and used in the work. After about June 1, 1911, the bolts were subjected to a close inspection. The limitation was fixed as follows:

The diameter of the turned bolts should not be less than nominal diameter nor more than the nominal diameter plus 0.005. One-and-one-half-inch turned bolts may not vary from 1.5 to 1.505 inches. (See Mr. Price's report, vol. 3, Appendix, p. 24.)

The contractor does not appear to have been able to make the bolts in accordance with this limitation. (See testimony of Mr. George C. Barnes, vol. 16, pp. 127 to 139, inclusive.)

Mr. Barnes states, on page 135, volume 16 of his testimony, that:

After they had decided to award the contract for making bolts to the Pittsburgh Screw & Bolt Co., they gathered up all the bolts that they had in their shop—finished, partially finished, and unfinished—and shipped to the Pittsburgh Screw & Bolt Co. to be put in proper shape, and of that lot there was about 60,000 pounds—I do not recall the total number of bolts—of which 29,000 pounds were accepted and shipped to Panama, 31,000 pounds being returned to Rankin shops by the Pittsburgh Screw & Bolt Co.

That assortment or inspection was made by the Pittsburgh Screw & Bolt Co., their own inspectors, and those that they sorted out as good were finished up, nuts put on them, and submitted to me for inspection.

Q. Did you inspect them?—A. Yes, sir.

Q. What kind of an inspection did you give them there at the Pittsburgh Screw & Bolt Co.?—A. I went over each and every bolt; I had a table erected



4 feet wide and possibly 40 feet long, covered with sheet iron. I had the bolts piled on one end of that table. I sat at that table on a stool and handled each and every bolt by putting the gauge on them and trying the nuts, and examined them for smoothness; if acceptable, they were passed onto a table, greased, and put in kegs ready for shipment; if rejected, they were put in kegs at my feet.

Q. Did you carry out that inspection at the Pittsburgh Bolt & Screw Co. through the entire contract, until all of the bolts that were to be furnished under the contract had been finished?—A. Yes, sir.

Q. Did you give all of the bolts that were furnished by the Pittsburgh Bolt & Screw Co. the character of inspection that you have described here?—A. Yes, sir.

Q. Did you inspect the bolts that you received from the Pittsburgh Screw & Bolt Co. in the same manner and apply the same test to them that you applied to the bolts that were made by the McClintic-Marshall Construction Co.?—A. I did, sir.

Q. Did you ever suggest to the McClintic-Marshall Construction Co. that they had better let the contract for the making of the turn bolts to the Pittsburgh Screw & Bolt Co.?—A. Not that I recall, in an official way. I believe I made the remark to Mr. Boocks that I thought the bolts should be made by a bolt maker when there were such close limitations specified.

Q. What was your reason for making that remark to Mr. Boocks?—A. Due to the condition the bolts were submitted to me for inspection as made by the McClintic-Marshall Construction Co.

Mr. Stanley Kress did not make the bolts at the Pittsburgh Screw & Bolt Co., as he claims to have done in a letter of July 1, 1914, quoted on page 33 of this claim. This letter does not state the facts. (See testimony of Mr. Kress, vol. 18, pp. 1 to 11, inclusive; also testimony of Mr. Barnes, pp. 137 and 138, vol. 16.) All that part of the claim of the McClintic-Marshall Construction Co. based upon this letter and what it shows is erroneous. The use of this letter in an attempt to establish a material part of this claim, without a more thorough investigation of the facts than was made, was inexcusable on the part of the contractor, and shows, to say the least, carelessness on the part of Mr. Pittman in assembling the evidence upon which they were to rely in support of their claim. Mr. Pittman doubtless believed that the letter as prepared by him stated the facts. (See testimony of Mr. Pittman in vol. 12, p. 138; see also vol. 15, Mr. Pendergrass's testimony, pp. 114 and 115.) This did not, however, excuse him, in a matter of such importance, from verifying the statements before he allowed them to go into the record, and it shows carelessness in the preparation of the claim in this particular.

On page 138, volume 12, a letter quoted on pages 32 and 33 of the claim was called to Mr. Pittman's attention, and he was asked:

Do you know this man S. Kress personally?

Mr. PITTMAN. No; I do not know him personally.

Mr. STERRETT. Would you care to testify as to the correctness of that letter?

Mr. PITTMAN. Well, I know that that letter was written by this man Kress, who first worked here and then went to the plant of the Pittsburgh Screw & Bolt Co. He is known by a number of our employees here at Rankin.

Judge HARRAH. I think we had better have Mr. Kress testify as to that.

Subsequent to the testimony of Mr. Kress, Mr. Pittman was recalled to the stand and testified as follows (see pp. 114, 115 of Mr. Pendergrass's testimony, vol. 15):

Judge HARRAH. Mr. Pittman, on page 33 of the claim I find a letter that was written and signed by S. Kress. There is some testimony here, at the last session at Rankin, that you wrote that letter.

Mr. PITTMAN. Do I know who wrote it?

Judge HARRAH. Did you write it?



Mr. PITTMAN. Yes; I wrote the letter.

Judge HARRAH. Will you explain how you came to write it?

Mr. PITTMAN. Why, the letter was based on information given to me by Mr. Boocks and Mr. Gusky; and Mr. Kress had stated to them in conversation the subject matter as covered by that letter. I merely wanted to get the matter on record and make it clear; so I wrote the letter, and Mr. Boocks and Mr. Gusky submitted it to Mr. Kress and asked him to read it——

Judge HARRAH (interposing). Well, you do not know what they said to Mr. Kress?

Mr. PITTMAN. I do not know from personal knowledge; I was not there.

Judge HARRAH. You wrote the letter and turned it over to Mr. Boocks to be sent to Mr. Kress?

Mr. PITTMAN. That is right.

Judge HARRAH. Had Mr. Kress said anything to you before you wrote the letter about what he knew about the case?

Mr. PITTMAN. No; I never had seen Kress until he was here yesterday [meaning June 30 or "the day before yesterday"].

Judge HARRAH. Then you wrote the letter supposing that it embodied the facts as you understood them?

Mr. PITTMAN. Yes, sir; that is right.

Mr. STERRETT. At the time, Mr. Pittman, that you handed that letter in to the Contractor, did you make an explanation at that time that the letter was written by you and signed by Mr. Kress?

Mr. PITTMAN. No; I did not make any explanation to anybody to that effect.

Mr. STERRETT. That is all.

The method under which the bolts were inspected was to have an accurate gauge made with one hole the exact size of the bolt and one hole five-thousandths inch larger in diameter than the size of the bolt specified. If the bolt would go into the smaller hole it was considered undersize and was rejected. If it would not go into the larger hole it was considered oversize, and the Contractor was required to correct it. A turned bolt should be so made that it will fit the hole so closely as to require gentle driving. It must also be smooth, accurately turned, and of uniform diameter throughout. In fact, the making of a turned bolt is practically a machine-shop job. The inspection of turned bolts was close, as it should have been, and the contractor did not make the bolts with such accuracy as to meet reasonable requirements as to turned bolts.

The total amount of material that the Contractor appears to have ordered for making turned bolts in his plant is 198,598 pounds of steel rounds purchased from Jones & Laughlin Co. at \$1.40 per 100; 36,028 pounds of steel rods purchased from the Union Drawn Steel Co. at an average price of \$2.26 per 100. They purchased 696,226 pounds of finished bolts from the Pittsburgh Screw & Bolt Co., for which they paid \$30,201.78. The total amount for which they were paid under item 2 was 904,426 pounds. It appears, therefore, that they were paid for 208,100 pounds more than they purchased from the Pittsburgh Screw & Bolt Co. They were paid for 51,066 pounds excess weight on bolts purchased from the Pittsburgh Screw & Bolt Co., on the grounds that these bolts were slightly heavier than those manufactured by the McClintic-Marshall Construction Co. For this excess weight they were paid \$3,727.82. The total charged against item 2 in their books is 922,942 pounds. The total amount of material for which they were paid was 904,426 pounds, showing that the only material that they could have lost or put in stock was 18,518 pounds. It is possible, however, that the 51,066 pounds excess weight



for which they were paid was not charged against the contract, and that a like amount of material may have been scrapped or put in stock that they bought from the Jones & Laughlin Co.

The evidence in connection with the claim and whatever part of it that may depend upon the way the contract was executed in connection with the turned bolts is such that no allowance can equitably or justly be made because of the manner in which the contract was carried out as to the manufacture of the turned bolts.

*Workmanship.*—There is no doubt from the testimony that, after the first eight leaves were manufactured, the work was inspected in great detail, and that as turned out and accepted it was first class. Many of the details in connection with the inspection and the close limitations imposed have been heretofore set forth in this report. After the trouble with the assembly of the first leaf in the shop, the inspection appears to have been much more in detail, and the limitations appear to have been much more accurately and definitely fixed and adhered to.

Most of the employees of the McClintic-Marshall Construction Co.—in fact, all of the employees that were called as witnesses—testified as to the great accuracy required in this work as compared with other work that had gone through the shop. Most of the superintendents and shop inspectors and the engineers of the McClintic-Marshall Construction Co. have testified that the accuracy demanded was considered by them to be in excess of any reasonable requirements that might be made under the specifications. Mr. Guynn, Mr. Crane, and Mr. Price, who were chief inspectors of the Isthmian Canal Commission, all testified that they did not think that they were requiring any greater accuracy in the work than they were authorized to demand under the specifications, although Mr. Price did state he demanded great accuracy. Mr. Crane went so far, however, as to say that the first work turned out was not equal to the class of work that he had received from the contractor on other contracts for high-grade bridge work.

Most of the shop inspectors of the Isthmian Canal Commission have been examined, and they all testify that a high degree of accuracy in connection with the work was demanded, and, with the exception of Mr. Harber, they practically all claim that their demands were necessary to secure first-class workmanship, or that they were making them under instructions from Mr. Hammer, who considered that the demands were necessary to secure first-class work. Mr. Hammer stated in his reports to Mr. Goldmark that a high degree of accuracy was being demanded and that the Contractors were working to obtain it.

Mr. Oliver Harber, who was one of the Commission's inspectors, considers that the inspection was unnecessarily severe. Mr. Harber was one of the inspectors whose work was most satisfactory to the Contractor.

Mr. C. M. Neeld, manager of the Contractor's Rankin shop No. 2 from the beginning of the fabrication of the material to June 1, 1911, was of the opinion that the Isthmian Canal Commission's inspectors and engineers demanded a higher class of work than the specifications called for. (See pp. 31 to 33 of his testimony, vol. 23.)



Mr. Pittman, the second manager of the Contractor at Rankin, testified that the work as manufactured was of a much finer grade than required by circular 576. (See vol. 12, pp. 8 to 10.) On page 10 Mr. Pittman states what he considers the difference between high-grade structural work and high-grade bridge work, as follows:

The principal difference is the somewhat superior workmanship in high-grade bridge work.

He thinks that the work would come under the heading of structural work rather than bridge work.

Mr. Connley, the general superintendent of the Contractor at the Rankin plant, states that the work was about two or three times better than any first-class bridge work he had ever seen going through the shops. (See p. 9, vol. 22).

Mr. Reed, superintendent of shop 2 at Rankin, states that he had never seen anything like the requirements of the inspectors in all the time he had been in the business. (See p. 87, vol. 10.)

The different foremen in shop 2, at Rankin, testified that the work of the lock-gate material was much harder than any work they had ever had any experience with. This testimony is found in volume 20.

Mr. Wagoner, the Contractor's shop inspector, thinks that the work as gotten out was of a finer grade than called for in the contract. (See vol. 19, p. 96.) Mr. Wagoner states that—

The inspectors were overexacting in requiring unimportant dimensions and details and excessive finishing and, I would say, handling.

Mr. Guynn, the first chief inspector on the work, says that he does not think Mr. Hammer was demanding a higher class of work under the specifications than was justified. (See p. 29 of his testimony, vol. 6). He does state, on page 28, however, that—

Mr. Hammer adhered very closely to the specifications, and we wanted it, and exacted it, as near perfect as it could be gotten. They were held very close to the specifications.

Mr. Crane does not think the work as turned out at the time he was there was first class, as required by the specifications, and in accordance with the instructions given him by Mr. Goldmark. (See p. 38, vol. 5.) He does state, however (p. 99), that—

I felt this way, that the work was a national work, and that everyone should see that the work that went down there should be just as near perfect as possible, because, as I stated then, and have stated since, I felt that it would be criticized and examined by engineers from every nationality all over the world, and I went on with the expectation of doing the fair and honest work for both sides.

Mr. Crane says on page 100:

There was not a thing there that we asked for that wasn't fair, square, straight requirements of the specifications, as I looked at it.

Mr. Price, the chief inspector of the Isthmian Canal Commission from May 8, 1909, until February 15, 1913, states that he does not consider that the Commission's engineers and inspectors received any better work than the character of the work demanded. Mr.

Price followed Mr. Hammer's instructions very closely, and Mr. Hammer was demanding great accuracy in the work. The details heretofore given in this report illustrate fully the character of the workmanship that was required on the lock gates. (See quotation from Mr. Price's testimony, pp. 129 to 134, inclusive, of this report.)

The comparison of the shop cost of the lock-gate material with the average departmental shop cost of all material passing through shop 2 from 1909 to 1910 and from 1913 to 1914, made on page 49 of this report from data furnished by the McClintic-Marshall Construction Co., in volume 27 of the evidence, shows in what particular operations the cost of fabricating the lock-gate material was greater than the cost of fabricating other material with which it was compared. This comparison also indicates wherein the excessive demands of the Isthmian Canal Commission's inspectors, if any, were made, and it is thought that this departmental shop cost of the various operations probably furnished a better basis of comparing this work with other work than any general statements of inspectors, superintendents, etc.

There were four operations that entered into the departmental shop cost of this work and also into the general expenses of fabricating this material that are practically peculiar to it, so far as the operations of the McClintic-Marshall Construction Co. are concerned, and in comparison with other work passing through shop 2 for the year preceding and the year succeeding the fabrication of the lock-gate material. These operations are pickling, sand blasting, the use of the large bulldozer, and the use of the duplex milling machine. The statement below shows the increased cost of fabricating this material that was due to these operations:

Plant and material, pickling-----		\$14, 918. 10
Shop cost of pickling-----		6, 318. 75
Sand-blast machine-----	\$3, 724. 83	
Dust arrester, sand-blast, elevator, and separator-----	2, 208. 52	
Additional sand-blast machine-----	753. 36	
	6, 686. 71	
Credit-----	500. 00	
		6, 186. 71
Shop cost, sand-blast-----		13, 002. 00
No. 9, Wm. White bulldozer-----	9, 975. 20	
Remodeling crane over new bulldozer-----	180. 27	
2 cast-iron dies for bulldozer-----	1, 130. 49	
Bulldozers-----	590. 06	
	11, 876. 02	
Credit (account bulldozer)-----	2, 250. 00	
		9, 626. 02
Shop cost, bulldozer-----		6, 390. 89
1 duplex milling machine-----	10, 485. 11	
Clamps for duplex milling-----	42. 53	
Table for plate milling machine-----	278. 63	
	10, 706. 67	
Credit-----	3, 000. 00	
		7, 706. 67
Shop cost, duplex milling-----		3, 184. 75
Total-----		67, 333. 89



The total expenses for these operations was \$67,333.89. This is equivalent to an increase in the tonnage price of the material of \$1.244 per ton.

It is also shown that in pickling and sand blasting the material a great many defects were developed that in all probability would not have been discovered in other material passing through the shops. The rejection of material for surface defects developed in pickling would increase the handling charges and would increase the administrative expenses in connection with such material and would tend, to some extent at least, to reduce the output in the shop.

These four operations are treated separately and put in a class by themselves, for the reason that they are peculiar to the lock-gate material, so far as any comparison of lock-gate material is to be made with other material passing through shop 2 for the year immediately preceding and the year immediately succeeding the fabrication of the lock-gate material.

The record of rejections at the pickling plant for surface defects shows that the following material was rejected for such defects:

	Pounds.
286 sheathing plates.....	907, 326
39 web plates.....	24, 640
5 doubling plates.....	7, 239
18 bent plates.....	11, 020
68 wedges.....	18, 620
159 frame angles.....	3, 430
10 splice plates.....	1, 135
4 intercostal angles.....	120
6 footwalk angles.....	420
7 fillers.....	105
Total.....	974, 055

It is probable that the greater portion of this material was replaced by the mills, but the cost for pickling and the shop cost of handling the rejected material would be increased by reason of this operation. For detailed list of the above material, dates of rejections, see Exhibit 8 of Frank Price's supplemental testimony taken at Rankin, June 30, 1915, General Exhibit No. 18.

All these details are important as tending to show the inherent difficulties which attended to the fabrication of the lock-gate material, independently of any unreasonable or unnecessary demands that may have been made by the Commission's inspectors.

A further very interesting comparison of this work with other work can be made through the departmental shop cost, as furnished by the McClintic-Marshall Construction Co.

Assuming the average departmental shop labor cost per ton for the years 1909 to 1910, inclusive, and from 1913 to 1914, inclusive, as the normal, and comparing the departmental shop labor cost of the lock-gate material with this as a normal, we find, as shown in the table on page 186, that in all the main items of cost the fabrication of the lock-gate material was much above the normal. The table (p. 186) gives the item to which the cost is applied, the average cost per ton for the year preceding and the year succeeding the fabrication of the lock-gate material, the average cost of fabricating the

lock-gate material, and the percentage of the normal with the fabrication of the lock-gate material cost:

No.	Description of item.	1909 to 1910 and 1913 to 1914 (com- bined).	Lock-gate material.	Per cent of normal.
1	Making templates.....	0.2773	0.0927	0.334
2	Making patterns.....	.0115	.0009	.782
3	Unloading.....	.1191	.1275	1.070
4	Plate straightening.....	.0441	.0629	1.426
5	Running in.....	.1187	.1021	.880
6	Stockyard.....	<sup>1</sup> .0400	.0590	1.475
7	Shearing.....	.2174	.2491	1.145
8	Laying off.....	.3110	.4209	1.353
9	Trucking in L. O. and P. depts.....	.1241	.1462	1.178
10	Punching.....	.6074	.9062	1.491
11	Punching cont. washers.....		.0027	( <sup>2</sup> )
12	Drilling.....	.1038	.2020	1.948
13	Milling.....	<sup>3</sup> .0010	.1171	117.100
14	Edge planing.....	.0260	.2277	8.757
15	Bending and straightening.....	.0341	.0580	1.700
16	Fitting.....	1.1444	1.3177	1.121
17	Trucking in F. and R. depts.....	.1177	.1540	1.308
18	Making jigs.....	.0002	.0139	69.500
19	Reaming.....	.2441	.1055	.432
20	Subpunched reaming.....	.3470	.9440	2.720
21	Countersinking.....	( <sup>4</sup> )	.1185	( <sup>2</sup> )
22	Machine riveting.....	.7180	.6111	.851
23	Hand riveting.....	.2614	.0292	.111
24	Cut out and redrive rivets.....	( <sup>5</sup> )	.2410	( <sup>2</sup> )
25	Rotary planing.....	.1096	.2704	2.467
26	Boring.....	.0141	.0086	.610
27	Calking and riveting ladders.....		.0333	( <sup>2</sup> )
28	Grinding.....		.0162	( <sup>2</sup> )
29	Chipping.....	.0753	.2643	3.909
30	Blacksmith shop.....	.1607	.7689	4.784
31	Machine shop.....	.1537	.2002	1.302
32	Running out.....	.1176	.1948	1.648
33	Storing.....	.0014	.0016	1.142
34	Loading and bracing.....	.1270	.1580	1.244
35	Indirect labor.....	.4328	.3565	.823
36	Painting.....	.1820	.2073	1.139
	Total.....	6.2425	8.7900	.....
	Add for pickling, bulldozer, and sand blast.....	.0091	.....	.....
		6.2516	8.7900	1.408

<sup>1</sup> Welding and duplex milling.    <sup>2</sup> No normal.    <sup>3</sup> Pickling.    <sup>4</sup> Bulldozer.    <sup>5</sup> Sand blast.

The detailed comparison of the departmental shop cost above given, and the percentage in the various operations above normal on the lock gates almost uniformly support the proposition that the workmanship on the lock-gate material, as to the principal operations, was of a higher grade than the average workmanship of all material that passed through shop No. 2 for the year immediately preceding and the year immediately succeeding the lock-gate material, unless we are to conclude that practically all the expenses above the normal in the various operations were due to excessive requirements of the Isthmian Canal Commission's inspectors. Some of the expenses above normal, in some of the operations, were undoubtedly due to requirements in excess of those authorized under the specifications, and the workmanship as to a part of the shop operations was better than the Commission was fairly and justly entitled to receive under the specifications and the modifications made in those specifications in the agreement of August 8, 1910. Making due allowances for these excesses, however, the lock-gate material does appear to have been more difficult to fabricate and more expensive than the average material passing through shop No. 2 for the year immediately preceding and



the year immediately succeeding the fabrication of the lock-gate material, by reason of the better class of workmanship that was rightly required under the specifications for the lock-gate material. This special class of workmanship that was necessary on the lock-gate material does not, however, explain all the increased cost in the fabrication of the lock-gate material.

The first paragraph on page 15 of the Contractor's claim in support of claim 2, viz:

That the Commission's engineers and inspector demanded and received shop-work of a much more refined and costly character than that called for by the contract—

is substantially established by the testimony of witnesses, records, and documentary evidence referred to, quoted from, and commented on above.

*Organization.*—The second contention in support of claim 2 (p. 15) is:

That for a long time both the engineering and inspecting organizations of the Commission at the shop were inadequate to handle the work.

The organization that was established for the inspection of the lock-gate material at the Contractor's plant at Rankin, Pa., consisted of an assistant engineer, a chief inspector, and such other inspectors as were deemed necessary. The assistant engineer that was placed in charge was Mr. J. Hammer. His first chief inspector was Mr. George F. Guynn. Mr. Guynn was in charge as chief inspector from August 8, 1910, to about March 1, 1911. (See testimony of Mr. Guynn, vol. 6, and his report to Col. Hodges dated Dec. 15, 1914, attached to his testimony.)

Mr. William H. Crane was the second chief inspector at Rankin. He was around the shop familiarizing himself with the work during a part of February, 1911, and up to March 6, 1911, when he became chief inspector. He was chief inspector until May 5, 1911. (See testimony of Mr. Crane, vol. 5.)

Mr. Frank Price was the third chief inspector. His period of service extended from May 8, 1911, to February 15, 1913. (See testimony of Mr. Price, vol. 10, and his report, vol. 4, of the evidence.)

Mr. Guynn conducted the inspection on the theory that errors in the work would be developed by the assembly of the first leaf in the yard, and he did not attempt to do a great deal of detailed inspection, except in cases where the errors would not develop in the assembly of the first leaf. He went over his work thoroughly before he left for the Isthmus, and made a report on conditions. (This report is Exhibit No. 1, in vol. 6; see also pp. 64, 65, and 66 of this report.) He had a sufficient number of employees to conduct the inspection in the manner in which it was being done by him. (See vol. 6, p. 41.) He did not have help enough to give the material a detailed inspection, such as is usually given to material for the Panama Canal. (See testimony of Maj. Boggs, vol. 23, p. 66.)

The organization under Mr. Guynn was adequate to inspect, as Mr. Guynn was inspecting, but was not adequate to give a detailed inspection such as was afterwards conducted. After the assembly of the first leaf and Mr. Hammer had requested that all girders should be checked up with steel templets great congestion took place

in the yard as a result of this check and the uncertainty as to what should and what should not be accepted. This condition continued from February 15, 1911, until Mr. Goldmark visited the work in April, 1911, and even for some time thereafter. (See Goldmark's testimony, pp. 35 and 36, vol. 8.)

Owing to the great increase in the work, due to a change in the method of inspection after the assembly of the first leaf, the force of inspectors was inadequate to handle the inspection from February 15, 1911, until some time in June, 1911. (See testimony of Mr. Price, pp. 30 and 31, vol. 10.)

During the time that Mr. Crane was chief inspector the chief engineer of the McClintic-Marshall Construction Co. wrote Mr. Hammer a letter (Apr. 18, 1911), complaining that a large amount of material was in the yards ready for inspection and stating that—

You will see from this that our shop is always ahead of your inspection force. It is further unquestionably true that our shop is gaining on your force all the time, which makes the situation become more aggravated every day. If relief is not furnished soon, the time is not so very far off when we will practically have to shut down our shop in order to enable your men to sufficiently catch up with the inspection until such a time that the congestion is sufficiently relieved for us to resume operations.

Mr. Crane replied to Mr. Hammer in detail to this complaint under date of April 19, 1911. A copy of the letter of the claimants and of Mr. Crane's reply is attached to the testimony of Mr. Crane, volume 5, and for ready reference copies are also attached to this report. This reply of Mr. Crane is a record made at the time, and from it it would not seem that any considerable amount of material could have been in the yard so placed as to be ready for inspection. The details of conditions as they existed at that time are given fully by Mr. Crane. The last paragraph of Mr. Crane's letter is as follows:

True the force is small, but had there been forethought and proper protection provided against the inclement weather and proper placing and arrangement of the material for the inspector for the past 60 days every item ready on contract No. 4845 would have long since been inspected, and much of the girder work on No. 4847. During the two weeks' let-up on work in the shop the shop inspector was practically idle. He has inspected the intercostals after sand blasting; also the I beams and every beam and intercostal in the yard could have been finally disposed of had they been ready. The inspectors have worked overtime. Personally I have been on the work at 7 a. m. surface inspecting the output of night sand blasting, check weighing, and getting painting done. There is seldom a day the inspectors do not lose two to four hours waiting on crane service. Doubling the inspecting force is very proper, but will be useless unless positive effort is made by the company to provide and arrange the material properly for inspection.

It is established, however, from all the evidence that the inspection force was inadequate for the period from February 15, 1911, to some time in June, 1911. But it is also established that the Contractors were not entirely without fault. (See Mr. Crane's letter to Mr. Hammer of Apr. 19, 1911, referred to above.) The material was not properly placed, nor proper protection given to provide against inclement weather, and there was also some interruption in crane service, all aggravating the inadequacy of the inspection force.

The third contention in support of claim 2 (p. 15) is:

That the Commission's shop inspectors were at times unreasonable, indecisive, and inconsistent, creating in the shop organization a state of uncertainty as to what would be acceptable to the inspectors.



Paragraph 43 of the specifications provides:

All workmanship must be first class in every particular, and all methods used during manufacture shall be satisfactory to the chief engineer or his authorized representatives. Material undergoing fabrication will be inspected by the inspectors employed by the Commission. All material coming from the mill shall be perfectly straight before any work is done upon it at the Contractor's works.

Article III of the contract provides in part that:

It is further understood, covenanted, and agreed that all materials and workmanship used and applied under this contract in details and finish shall be first class and of the very best quality, and that all materials, both in the form of raw materials and at every stage of manufacture, and all workmanship, shall from the beginning to the end of the work be subject to the inspection of the chief engineer of the Commission or his authorized representative. \* \* \*

It is further understood, covenanted, and agreed that the Commission's inspectors may at any time reject any or all work or material not in accordance with this contract, and the right to reject any and all defective work or material shall continue until final inspection and acceptance and payment for material and work herein provided for, regardless of any prior inspection, payment, or act of the Commission, and such defective or unsatisfactory material or work shall be promptly removed, remedied, or replaced by the Contractor without expense to the Commission. \* \* \*

Article XII of the contract provides:

All questions relating to final inspection and acceptance of the materials and workmanship to be furnished hereunder, or the failure of such materials and workmanship to comply with the specifications, or to the causes and extent of delays in delivery or erection, shall be determined by the chief engineer of the Commission, or by any officer or deputy to whom the chief engineer may assign that duty, and such decision, when expressed in writing, shall be final.

The greater the power conferred on an officer under a contract as to the decision of disputed questions, the greater the duty to exercise an honest and fair judgment. (*Ripley v. United States*, 223 U. S., 695.)

There were but few limitations fixed in the contract to which the contractor should work, and what should be considered as first-class material and workmanship within the meaning of the contract was left largely to the judgment of the Commission's engineers and inspectors.

The questions as to whether or not it was reasonable to require the accuracy that was demanded in the spacing of the holes and as to whether or not it was reasonable to change the size of the holes so that a greater per cent of them might be made to clean up in reaming, as well as many other questions relating to the reasonableness of the accuracy demanded in other details of the work, have heretofore been considered.

Whether a shop inspector was reasonable or not in particular cases would depend upon whether or not such inspector was following the specifications and drawings or the instructions of his superior as to the way the specifications and drawings should be construed with such variations as are allowed in usual practice.

The limitations in details heretofore considered and the dimensions called for by the drawings were followed very closely by the shop inspectors and work was sometimes held up by the shop inspectors that was subsequently passed by the chief inspector, and sometimes it was submitted to Mr. Hammer and he would occasionally pass it

over the chief inspector. (See the letters quoted on pp. 27, 28, 29, 30, and 31 of the claim.)

Mr. Neeld testified as follows (see pp. 30, 31, and 32 of vol. 23) :

It is charged here in the claim of the Contractor "That the Commission's shop inspectors were at times unreasonable, indecisive, and inconsistent, creating in the shop organization a state of uncertainty as to what would be acceptable to the inspectors."

Q. Did that condition exist while you were there?—A. Yes, sir; it did.

Q. In what respect?—A. Well, I think that describes it almost as well as I could, that the different ones would go around measuring a thing and fussing with it, and they would not definitely stamp up anything—practically nothing; I would not say they would not stamp anything—so that we could not tell whether it was going to be accepted or rejected, or whether part of it was going to be rejected, or what attitude they were going to take; and sometimes it would lie there for days; and sometimes out in the yard it would lie there for weeks.

Q. Did that condition exist while Mr. Guynn was there?—A. Well, to a greater or less extent, it did; I do not remember how long Mr. Guynn stayed there. My impression now is that Mr. Guynn was a little more decisive. But even while he was there, as I recollect, there was a good deal of that holdup.

Q. Well, did you know Mr. Crane?—A. Well, you know, I have forgotten Crane; I undoubtedly did know him.

Q. Did you know Mr. Hurlston?—A. I knew Mr. Hurlston, yes, very well.

Q. Did you know Mr. Wheateroft?—A. He was a little fellow, I believe?

Q. Yes.—A. Yes; I remember him.

Q. Did you know Mr. Gause?—A. I do not recollect him.

Q. Mr. Gause seems to have been the person who did the measurements of the holes in that early part of the work.—A. Well, I do not recollect him now.

Mr. WOLFEL. Pardon me, Judge. Mr. Gause's work was confined to checking holes in the webs of the girders; he had nothing to do with checking the open field holes in the outstanding legs of the flanges of the girders. That was done by Mr. Spencer and our men and some of the other inspectors.

Judge HARRAH. All right. Well, did you know Mr. Spencer?

Mr. NEELD. I do not recollect Mr. Spencer now.

Q. Well, what you do recollect about it is that you had trouble in getting that work through?—A. I had trouble in abundance, so much so that I do not know but that it had something to do with my leaving Rankin, as I thought life was too short to bother with inspection of that kind; it was terribly aggravating.

Q. Did you have any trouble to get work inspected when it was ready for inspection?—A. To get a final say on it; yes. Of course, it was inspected galore; there was no shortage in looking over it and finding fault with it, and this thing and that, and turning it over, and all of that; but as to real inspection, to say "This will go," and "This is absolutely rejected," we had difficulty.

Q. Well, is it not a fact that the principal difficulty and the principal reason why they were not passing that work finally was because of the fact that there were defects in it, and they were waiting for some higher authority to determine whether or not the defects they claimed to exist were sufficient to reject it?—A. Well, as I recollect it in sizing it up now, they seemed to place determinations and demand a class of work that they had no right to do.

At a meeting in Mr. Marshall's office April 12, 1911, the subject of the character of the inspection being made while Mr. Crane was chief inspector was considered, and in reply to a question as to what objections were made to his methods of inspection Mr. Crane stated (see pp. 83 and 84 of vol. 5) :

Judge HARRAH. Now, Mr. Crane, can you state what seemed to be the general objections to the Contractor to your method of inspection during this conference?

A. Well, there were two or three criticisms; first was the close inspection and the slowness of the inspection in measuring in detail all of these girders. Mr. Hurlston and Mr. Barnes were placed together on the measuring and checking of these girders; checked about two girders a day. When we got ready to ship they were there doing that work—at the time Mr. Price came and



at the time Mr. Goldmark came there. I think—I do not know—they criticized the slowness of our inspection, of course. I remember Mr. Reed criticized the inspection of the **A** frames and some of the other frames—**B** frames and such as that—that were being done by Mr. Hurlston. He was assigned to do that part of the inspection. I do not think we had any criticism from Wheatercroft on the plate work. Wheatercroft kept up pretty well on the plate work. (See also pp. 73 to 88, inclusive, vol. 5, of testimony.)

Mr. Price's views on this part of the claim were (see pp. 32, 33, and 34 of vol. 10) :

Q. We find this charge on page 15 of the claim :

"That the Commission's shop inspectors were at times unreasonable, indecisive, and inconsistent, creating in the shop organization a state of uncertainty as to what would be acceptable to the inspectors."

A. Well, I have always thought that that clause referred to a time before May 15—or the latter part of May—because we had a good inspection force after that time, and we were following the work right in the shop, inspecting it in the shop.

Q. Well, were you deciding questions when they would be raised; did you decide them promptly?—A. There were very few questions that were not decided promptly. That question I have mentioned about the **A** frames; that came up later, though.

Q. Well, would you decide to-day that something was all right, and then a week later come to the conclusion that you ought to require something more?—A. I do not think we ever required more than the limit that was allowed; that is, we were allowed for the squareness of the **A** frame one-thirty-second inch.

Q. But you do not seem to get my point: Did you have any rules by which you would be governed in the inspection of the material, and were your decisions as to what would be passed by your inspectors consistent throughout?—

A. I think they were.

Q. Did you ever have any complaint from the shop inspectors or from Mr. Reed about having accepted material that you were talking about rejecting, or complaints about having accepted like material to that you were then considering for acceptance or rejection? Were there complaints that your decisions were not consistent and regular?—A. I believe that there were at times, and I think it happened in this way: We were allowed a limit of allowance—for instance, I am taking the **A** frames now, because I think there was more trouble on those than on any other. We were allowed a limit of allowance of a variation from the square of one-thirty-second inch. Now, if the conditions were all right and good in other respects, we sometimes would allow more; we would pass them when they were more out of square than that. And the shop men knew that; they were there when we examined them. The next day they would possibly want to go more than the limit, possibly go one-sixteenth inch out of square. That might be passed, and then the next day, when they were a trifle more than that, we would not pass them; we had to stop at some point.

Q. Well, when you reached those points, did you decide them right away?—A. I do not think there was much trouble about that; they were decided pretty quick. My inspectors would hold the work up for me as I passed through once or twice a day, for decision.

The subject of delays in deciding questions that arose from day to day as the work went through the shop is discussed by Mr. Pittman and Mr. Price on pages 150 to 168 of Pittman's testimony, volume 12.

Without further quotations from the testimony, the facts are that work was sometimes held for correction for an unreasonable time that should have been passed, and decisions in some cases were not as promptly made as they should have been. There was some uncertainty in the shop organization of the Contractor as to just how far the limitation could be exceeded without having the work held up. This is shown by the testimony of Mr. Price, quoted above (p. 53, vol. 10). It is also shown in the letter of Mr. Reed of March 12, 1912, copied in the claim, page 30, with respect to the footwalk frames. The shopmen must have known that there would be some deviation allowed by



the shop inspectors from the exact dimensions shown on the drawings and from the limitations fixed by instructions. It was in this zone that most of the clashes between the Commission's shop inspectors and the shopmen and shop inspectors of the Contractor took place. The personal equation played a large part in these clashes. This personal equation ran all through the work, and it was an ever-present question between the shopmen and shop inspectors of the Contractor and the shop inspectors of the Commission as to what was good enough from the viewpoint of the Contractor's shopmen and shop inspectors to meet the requirements of the contract under usual practice and special instructions of their superiors, and as to what was good enough from the viewpoint of the Commission's inspectors to meet the requirements of the contract as interpreted by them from the approved shop drawings, the specifications, and the instructions of their superiors. The difference in the personal equation undoubtedly resulted in frequent clashes between the Contractor's shopmen and shop inspectors and the Commission's inspectors, and probably caused more of the work to be held for correction or to be corrected than was usual and ordinary in the shop where it was being inspected, and probably more than the Contractor had a right to believe from the character of the work and the manner in which it was fabricated would be held up. (See testimony of Mr. Wagoner, pp. 97 to 109, vol. 19.)

The inspection after February 15, 1911, was consistently close and in detail, so much so at times as to be unreasonable. There was occasionally some delay in deciding questions that arose in connection with the work. The slow method of operation seems to have been due largely to the head of the shop organization. The Contractor had a right to expect greater promptness. Where there is an assistant engineer in charge of an inspection force it is to be expected by the Contractor that he will sometimes overrule his subordinates, but it is also to be expected by the Contractor that he will so organize and instruct his force that there will be a minimum of difference between his requirements and the judgment of the individual inspectors as to what should be accepted without question. The Contractor also has a right to expect that when questions do arise which must be decided by him that he will act promptly.

If we apply the rule that "What should satisfy a reasonable man does satisfy," the shop inspection was at times unreasonable. If we apply the rule that "What is to be decided should be decided promptly," the inspection as a whole was at times indecisive.

The mere fact that a superior overrules his subordinate does not prove that the subordinate is inconsistent. It tends to prove that he was wrong in that particular case, and it may also prove that he has taken his instructions too literally or that he has not been given the proper instructions, or, if it occurs very often, that he does not exercise the proper judgment.

The testimony seems to indicate that the shop inspectors in an excess of zeal, or from an exaggerated idea of the importance of the work, or because of their instructions in relation to the work, were at times demanding more than they had a right to. On the other hand, the shopmen and shop inspectors were attempting to stick too close to bridge and structural work and not making the proper allow-



ance for the difference between the lock-gate work and other work that the shop had been used to fabricating.

These two facts undoubtedly created some uncertainty in the shop organization as to what would be acceptable. The extent to which the Commission's inspectors were responsible for this condition and the damage to the Contractor resulting therefrom should be borne by the Government, and will be taken into consideration in passing on claim No. 2.

There is testimony tending to show that sometimes delays would occur in inspecting material after it was ready, owing to the failure of the Commission's inspectors to report for duty at particular times or places and act as promptly as it was considered by the Contractor's shopmen and superintendents that they should. It is claimed by the Contractor that such action on the part of the Commission's inspectors was in excess of anything that might have been reasonably expected under the contract, and that it operated to delay and interrupt shop operations.

These claims are generally denied and explained by the Commission's inspectors, it being claimed by the inspectors that in many cases where delay was claimed the material was not properly placed for inspection, or that in some cases they might be engaged on other inspections at the time when it was desired to have particular members inspected. It is also claimed by the Commission's inspectors that they reported promptly for duty and were willing and ready at all times to inspect material that was properly placed for inspection. One of the reasons why there may at times have been apparent delay in making inspections promptly was the different hours during which the Commission's inspectors worked and the Contractor's shop men and inspectors worked. The Commission's inspectors worked eight hours. They reported for duty at 8 in the morning and worked until 12, took one hour for lunch, and quit at 5. The Contractor's employees reported for duty at 7 in the morning, took one-half hour for lunch, and worked until half past 5, making a 10-hour day.

It does not seem to your committee that it would serve any useful purpose to enter into an examination of the evidence in detail on this feature of the claim. The evidence shows that the Commission's inspectors were competent to perform the duties to which they were assigned, and that they were men of good habits, and many of them of long experience. The close limitation to which they were required to work has heretofore been considered.

Except for the period prior to June, 1911, the inspection force was reasonably well organized for the purpose of conducting the inspection promptly, and was reasonably well supervised by Mr. Price, the chief inspector, from May 8, 1911, to the end of the fabrication of the work.

The personal equation in connection with the large force did, however, at times, to some extent, affect the organization, and there would be delays and interruptions in the work, and possibly to a greater extent than the Contractor might reasonably have expected. (See testimony of Mr. Conly, vol. 22, pp. 14, 32, and 33; Mr. Reed, vol. 10, pp. 94 to 102, 136, 137, and 143 to 146; Mr. Pittman, vol. 12, pp. 211 to 217; Mr. Crane, vol. 5, pp. 73 and 105 to 111; Mr. Price in vol. 18,



pp. 102 to 112; Mr. Wagoner, vol. 19, pp. 106 to 108 and 112 to 114; Mr. Hurlston, vol. 14, pp. 57 to 60; Mr. Wheatcroft, vol. 13, pp. 59 to 62 and 68 to 72; Mr. Gause, vol. 22, pp. 49, 50, and 54; Mr. Harber, vol. 18, pp. 55 to 63, 70 to 72, and 80 to 84; Mr. Williams, vol. 14, pp. 11 to 24; Mr. King, vol. 17, pp. 122 and 123; and the Contractor's shop men in vol. 20.)

The general effect of such delays and interruptions, to the extent that their effect on the work can be valued, will be taken into consideration in the allowance to be recommended under claim 2.

Essential facts in relation to claim 2 are established by the evidence, as follows:

(1) That the actual average cost per ton of fabricating the lock-gate material was greatly in excess of the average cost per ton of fabricating all other material that passed through shop 2 for the year preceding and the year succeeding the fabrication of the lock-gate material.

(2) That the average cost per ton should have been more for fabricating the lock-gate material than for fabricating all material passing through shop 2 for the year preceding and the year succeeding the fabrication of the lock-gate material instead of less per ton.

(3) That the fabrication of the lock-gate material in the shop was done "under requirements as to character and finish not fairly within the meaning of the specifications."

(4) That the average cost per ton of fabricating the lock-gate material in the shop was increased by reason of the work having been done "under requirements as to character and finish not fairly within the meaning of the specifications."

(5) That the only way by which the excess cost of fabricating the lock-gate material in the way that it was done over what it would have been if it had been fabricated under normal and usual inspections and under requirements as to character and finish fairly within the meaning of the specifications is to determine what was a fair normal price for fabricating lock-gate material, taking into consideration the inherent character of lock-gate material and such abnormal conditions as must have increased the average cost per ton of fabricating the lock-gate material over other material with which it is compared and for which the Contractor was responsible.

(6) That in arriving at a normal cost per ton for fabricating the lock-gate material, under conditions for which the Contractor was wholly responsible, the average cost per ton of fabricating all material passing through shop 2 from December, 1909, to November, 1910, inclusive, and from February, 1913, to January, 1914, inclusive, owing to the manner in which the records of the McClintic-Marshall Construction Co. are kept, must be taken as a true normal and used as a basis of comparison in determining what should have been the normal average departmental shop cost and general expenses per ton for fabricating the lock-gate material under conditions not chargeable to excessive requirements and demands made by the Commission's engineers and inspectors.

(7) That taking the average departmental shop cost per ton of the different operations under which the shop cost is carried for all material for the year preceding and the year succeeding the fabrication of the lock-gate material and comparing the cost of these operations with the cost per ton of the same operations performed



on the lock-gate material we find that the departmental shop cost for fabricating the lock-gate material should have been as shown in the table below:

Item No.	Character of operation.	Explanation.	Amount.
1	Templets (wooden).....		\$0.0927
2	Patterns.....		.0009
3	Unloading.....	The average for year before and year after is taken as a normal for lock gates.	.1191
4	Plate straightening.....	The Winner bridge, the Beaver bridge, and Pittman's estimate all fix this charge at 6 cents; Wolfel thinks it is one-third too high (see vol. 38, Exhibit 1, and Wolfel's statement in same). Charge fixed at.	.0600
5	Running in.....	The Winner bridge 8 cents, the Beaver bridge 10 cents, Pittman's estimate 9 cents. Average for year before and year after, \$0.1187. Fixed at.	.1000
6	Duplex milling.....	Not questioned.....	.0590
7	Shearing.....	Shearing Winner bridge 18 cents, shearing Beaver 16 cents. Average charge year before and year after lock gate, \$0.2174. Special attachment for shearing edges bought. Think it must have been as much as the average for year before and year after. Wolfel thinks one-third of shearing unnecessary. Fixed at average.	.2174
8	Laying off.....	Average for year before and year after, \$0.3110; Beaver, \$0.3000; Pittman, \$0.2000. Evidently too low. Part of charge for templets in this. Fixed at average plus \$0.0500 for templets.	.3610
9	Trucking in L. O. and P. departments.	Average charge 0.1241, Winner bridge 0.1000, Beaver 0.0800, Pittman 0.1500, Wolfel 0.0974. Fixed at.	.1300
10	Punching.....	Average year before and year after lock gate 0.6074, Wolfel 0.6200, Pittman 0.6200, actual 0.9062. Very large number shop rivets and field holes should account for at least half of increase over normal. Charge fixed at.	.7500
11	Punching construction washers.	Not questioned.....	.0027
12	Drilling.....	Average, year before and year after, 0.1038; Pittman, 0.1300; Wolfel, 0.1300; Winner, 0.1300; Beaver, 0.1000. No evidence to account for large increase for year before and year after. Large number of thick, heavy plates had to be drilled. Actual charge, 0.2020. Add 2 cents per ton for templates, 2 cents per ton for large number of field holes to Pittman's and Wolfel's estimate of 0.1300. Fixed charge at.	.1700
13	Pickling.....	No record to compare with. Actual cost, 0.1171. Pittman's and Wolfel's testimony, 0.1100. Charge fixed at.	.1100
14	Edge planing.....	Average for year before and year after, 0.0260; very low. Winner, 0.0800; Beaver, 0.0600; Pittman, 0.1600; Wolfel, 0.1600. A great deal more planing on lock gates than average material. Special planers bought for lock gates. Actual charge, 0.2277. Charge fixed at.	.1700
15	Bending and straightening...	Winner, 0.0200; Beaver, 0.0400. Estimate by Pittman, 0.0600; Wolfel, 0.0400. Actual charge, 0.0580. Average year before and year after, 0.0301. Fixed at.	.0500
16	Fitting.....	Average charge, year before and year after, 1.1444; Pittman's estimate, 0.8900; Wolfel's, 0.6600; Winner, 1.1000; Beaver, 1.1000. 62 per cent of material fitted. 62 per cent of 1.1444 is 0.7095. Add 0.1112 for yard labor, assembling, would make 0.8207. This is about 10 cents below Pittman's estimate. Average fitted material for lock gates must have been 20 per cent harder to fit than average for all material for year before and year after. 20 per cent of 0.8207 is 0.1641. Charge fixed at.	.9848
17	Trucking in F. & R. departments.	Average, year before and year after, 0.1177. Actual charge, 0.1540. Pittman's estimate, 0.1500; Wolfel's, 0.1232; Winner Bridge, 0.0800; Beaver, 0.1200. Charge fixed at.	.1400
18	Making jigs.....	Not questioned.....	.0139
19	Reaming.....	These two items will be considered together. Pittman fixes the charge for reaming at 10 cents, and the charge for subpunched reaming at 58 cents; total for two, 68 cents. Wolfel says the two should be considered together, and fixes the charge at 95 cents for the two. The two for the Beaver Bridge was 68 cents. A very considerable amount of this work was due to reaming interior connections—paragraph 32, Goldmark agreement. The total actual charge for the two operations was 1.0495 per ton. The excess over 95 cents per ton was probably due to close inspection. Charge fixed at 95 cents per ton.	.9500
20	Subpunched reaming.....		

Item No.	Character of operation.	Explanation.	Amount.
21	Bulldozer.....	This is an operation practically peculiar to the lock gates. Large, new bulldozer purchased; broke down once which would affect the cost. Pittman's estimate 8 cents, Wolfel's 0.0790. Actual charge 0.1185. Charge fixed at 0.1000.	\$0.10000
22	{ Machine riveting..... { Hand riveting.....	{ These two operations considered together. Total average per ton for two, year before and year after lock-gate work, 0.9794. 62 per cent of this total for the two operations would give 0.6072. Pittman's estimate for the two operations, 0.4500. Winner bridge, 0.9400. Beaver bridge, 1.000. Wolfel's estimate for two, 0.4695. There is about 140 shop rivets per ton in 62 per cent of the tonnage of the lock-gate material. This is considerably in excess of shop rivets for equal tonnage on average work. The actual cost was 0.6430. Charge fixed at 0.6072.	.6072
24	Sandblast.....	This operation is peculiar to lock gates. Actual charge, 0.2410. Wolfel's estimate, 0.2169. Pittman's, 0.2400. There was some extra work in this operation and probably some interruptions. Charge fixed at.	.2300
25	Rotary planing.....	Average, 0.1096. Actual charge, 0.2704. Pittman's estimate, 0.1600. Wolfel's estimate, 0.1600. Winner and Beaver bridge, 0.1600. Evidence shows special planers bought for lock gates—must have been more than average planing, very probably more than Beaver and Winner bridge. The evidence does not explain the difference between 0.2704 and 0.1600. This charge fixed at 0.2000.	.2000
26	Boring.....	Not questioned.....	.0086
27	Calking and riveting ladders.....	do.....	.0033
28	Grinding.....	{ These two operations will be considered together. No charge for grinding year before and year after lock gates—charge for chipping, 0.0753. Actual charge for lock-gate material: Grinding, 0.0162; chipping, 0.2643. Total for two, 0.2805. There was undoubtedly some extra grinding on rivet heads and probably on other parts. The chipping on rivet heads was more difficult because of the way it was required to be done. Pittman's estimate for the two operations was 0.2300. Wolfel's estimate, 0.1245. Chipping on Winner bridge, 0.0600; Beaver bridge, 0.1000. Charge fixed at.	.2000
29	Chipping.....		
30	Blacksmith shop.....	Average charge, year before and year after, 0.1607. Actual charge, 0.7689. Pittman's estimate, including bulldozer, 0.69.00. Wolfel's estimate, without bulldozer, 0.6151. Shops specially equipped for water-tight work; special blacksmiths hired. Pittman's estimate, including bulldozer, probably too low. Wolfel's estimate too low. After allowance of claim for extra on account of bounding angle hereafter to be made, charge fixed at.	.6900
31	Machine shop.....	Pittman, 0.0900; Wolfel, 0.1075; Winner bridge, 0.0800; Beaver bridge, 0.3800. Average, Winner and Beaver, 0.2300; 62 per cent of 0.23 fixed as charge.	.1426
32	Running out.....	Pittman, 0.1900; Winner, 0.0800; Beaver, 0.1400; year before and year after, 0.1176; actual charge, 0.1948. Evidence shows considerable extra work in this operation. Wolfel thinks charge entirely too high—should not be over 0.1176. Charge fixed at.	.1700
33	Storing.....	Not questioned.....	.0016
34	Loading and bracing.....	do.....	.1580
35	Indirect labor.....	This charge only covers the period from May, 1912, until the lock gates were finished. No evidence to show any great excess during this period. Pittman's estimate, 0.28. Wolfel fixes it at 0.2560. This would amount to an allowance on this item alone for the period from May, 1912, to February, 1913, of \$5,440. This seems excessive. The charge is fixed at.	.3400
36	Painting.....	There was some interruption in painting due to the character of the paint. Mr. Pittman's estimate, 0.1300; Winner bridge, 0.1400; Beaver bridge, 0.2000; Wolfel makes no comment. Year before and year after 0.1820. Lock gates probably more difficult to paint than average material. Charge fixed at.	.1900
	Total per ton.....		7.5228

This computation is based upon a total tonnage of 53,943.

(8) That at a normal cost for the departmental shop labor of \$7.5228 a ton the total normal departmental shop labor cost would be \$405,802.40.



If we take 91.3 per cent of the departmental shop labor cost as a normal general expense, the normal general expense for the lock-gate material would be \$6.87 per ton. At \$6.87 per ton for general expenses, 53,943 tons would cost \$370,588.41; \$405,802.44, the normal departmental shop labor cost, added to \$370,588.41, would make \$776,390.85. We should add to this \$52,488.94 for special equipment. We should also add for general expenses for purchasing castings \$14,658.56. The increase in general expenses for the lock-gate period, due to loss of output in shop No. 1, was 69 cents a ton on 53,943 tons, or \$37,220.67. This should also be added.

This increase in general expenses due to loss of output in shop No. 1 is found as follows:

The total tonnage for shop 1 for the lock-gate period was 58,406. This divided by 26 would give 2,246 tons as the monthly output. The tonnage of shop 1 for the 12 months immediately preceding and the 12 months immediately succeeding the lock-gate period was 73,725. This is equal to an average monthly tonnage of 3,072. This multiplied by 26, the number of months in the lock-gate period, would give a tonnage of 79,872 for shop 1 if the average had been maintained during the lock-gate period. The general expenses per ton during the lock-gate period in shop 1 was \$7.62. At this rate, if we compare with a tonnage of 79,872, or for 26 months, the total general expenses for shop 1 for the lock-gate period would have been \$608,624.64. At \$6.35 per ton (79,872 tons), the total general expense would have been \$507,187.20. This shows a total increase in general expenses due to loss of output in shop No. 1 of \$101,437.44. The total assumed tonnage on which this is based is 126,351 plus the difference between 58,406 tons, the actual tonnage of shop 1, and 79,872 tons, the assumed tonnage, making 147,817 tons on which the increase is based: \$101,437.44 divided by 147,817 gives 69 cents as the increase per ton in general expenses due to loss of output in shop 1. There should be added to the cost of the lock-gate material  $\$0.69 \times 53,943$ , or \$37,220.67. As heretofore shown, there should also be added 30 cents per ton increase caused by breakdowns in the powerhouse, or \$16,182.90.

On the basis stated, the total departmental shop labor cost and general expenses properly chargeable to contractor would be as follows:

Normal departmental shop labor cost, 53,943 tons, at \$7.5228 a ton	\$405, 802. 40
Normal general expenses, 53,943 tons, at \$6.87 a ton	370, 588. 41
Special equipment	52, 488. 94
General expenses, purchasing castings	14, 658. 56
Increased general expense, due to loss of output in shop 1, 53,943 tons, at 69 cents a ton	37, 220. 67
Increased cost caused by breakdowns in powerhouse, 53,943 tons, at 30 cents a ton	16, 182. 90
Total	896, 941. 88

The actual cost of fabricating the lock-gate material was as follows:

Departmental shop labor cost	\$474,161. 54
General expenses and administrative expenses, including special equipment	490, 478. 82
Total	964, 640. 36



Deduct from this (\$964,640.36) what it should have cost as shown above (\$896,941.88) and it leaves a difference of \$67,698.48. In the opinion of the committee the evidence shows that 90 per cent of this difference was due to the Contractor being required to fabricate this material "under requirements as to character and finish not fairly within the meaning of the specifications." The remaining 10 per cent excess cost over what is considered a fair normal appears to have been due to the inexperience of the Contractor in fabricating such portions of the work as might be classed as shop work.

Sixty-seven thousand six hundred and ninety-eight dollars and forty-eight cents reduced by 10 per cent leaves \$60,928.64. This sum will be further increased by allowances on specific claims hereafter to be made.

There are certain other items under claim 2 that do not appear to be fairly covered by the allowance made for increased shop cost under item 2 of the claim in the way in which that claim has been disposed of above.

Claim C-4, Appendix, page 27 of the printed claim: This claim appears to have been the subject of a supplemental agreement under date of June 15, 1911. In that agreement it was provided:

For the purpose of affording access to the end compartments in air chambers of lock gates it has been found necessary to substitute 11 by 15 inch manholes for the 10-inch diameter air vent in each end of girder in air chamber, and to substitute 11 by 15 inch manhole covers for 10-inch air-vent covers at these openings in ends of girders at top of air chamber, and the Contractor hereby agreed to make these modifications on the understanding that the individual parts as supplied shall be paid for at the same price per pound named in the original contract, under Washington order 23444, for the several classes of material, subject to the limits of overweight therein set forth; and the Contractor agrees to make no claim for reduction in amount to be paid for girders through reduction in weight on account of increase in size of holes cut through same or for added cost arising from any extra work involved, increase in number of rivets to be driven, etc., as a result of this modification, in consideration of the concession by the Commission affecting insurance requirements, as set forth in article 5.

The insurance requirements in article 5 were as follows:

The provisions in article 4 of the original contract of June 21, 1910, which require the Contractor to keep each gate, and the fixed parts for same, and all materials provided for and used or to be used in construction thereof insured against fire from the time of delivery on the Isthmus until such gates and fixed parts for same and material have passed the preliminary tests for water-tightness provided for in section 122 of the specifications, have been found to be unnecessary, and the Commission hereby waives the requirements of insurance on said gates and fixed parts and materials after delivery above referred to and for the period prior to the date the gates are loaded on the cars at the works upon the express condition that the cost of such insurance is to counterbalance and offset the changes to be made by the Contractor as set forth in article 4 hereof: *Provided*, That no payment shall be made until such insurance as is required herein becomes operative.

The Contractor insists that the insurance waived in this part of the contract was of no value and that, in fact, he was required to make the change in the size of the manholes in consideration of the waiver of a contract provision that was of no benefit whatever to the Isthmian Canal Commission.

Your committee does not think that this is one of the claims that comes within the equitable jurisdiction conferred by the act. The act, in the opinion of your Commission, does not give authority to relieve against express contract provisions.



As to that item, therefore, the added expense due to this change should be borne by the contractor.

C-6, Appendix, page 30: Adding bent angles at ends of girders, top of air chamber.

This change was insisted upon by Mr. Hammer to improve the work. The estimate is reasonable. The extra work operated to increase the shop cost and has been charged against the Contractor in establishing the normal above.

The amount of this claim as stated is:

Adding bent angles at ends of girders, top of air chamber; extra cost of shop labor, 188, at \$8 each.

As this was a change for the improvement of the work and one that was ordered by Mr. Hammer, and the Contractor has not been reimbursed for it, it is recommended that the amount, \$1,504, be allowed.

C-7, Appendix, pages 30-31: This claim as stated is as follows:

*Countersunk rivets.*—Extra cost of shop and erection. Labor and loss on account of material scrapped: Shop, 440,000, at three-fourths of 1 cent, \$3,300; field, 308,000, at 5 cents each, \$15,400.

The extra cost for these field rivets will be taken care of in the consideration of claim 6.

The shop cost of \$3,300 appears to be reasonable. The design did not require the countersinking of these rivets; it was considered that the countersinking was necessary, and, as it undoubtedly did improve the design, at a cost to the Contractor of \$3,300, included in the normal cost above established, it is considered that in equity, justice, and fairness this sum should be allowed to the Contractor.

The countersinking of the rivets removed 17 tons of metal, according to the estimate of the Contractor (and this is probably reasonable), on which the Contractor under the original design would, after allowing for scrap, have received \$59 per ton, or \$1,003. The Contractor should, therefore, be allowed this sum to cover this change. (See p. 8, Pendergrass's letter of Apr. 30, 1915, vol. 27 of evidence, ranking data.)

C-8, Appendix, page 31: This is a claim for extra compensation on account of being required to make the bounding angle for the water-tight frame in a different way from the way in which it was designed. Mr. Pendergrass states this claim in his estimate prepared April 30, 1915, bound in Exhibit 27, as follows:

Angles in water-tight frames made in one piece instead of four. Extra cost of shop labor—2,544 A frames, 96 B frames—2,640 frames, at \$3 each, \$7,920.

The work could not be made water-tight under the original design, and it had to be changed. (See testimony of Mr. Pendergrass, General Exhibit No. 15, pp. 62, 63, and 64, and statement of Mr. Nutting, superintendent of the mechanical division, of Nov. 4, 1915, filed under "Miscellaneous data.") Mr. Nutting states:

I consider that it would have been entirely impossible to make water-tight joints as shown by plan No. 5035.

To make the joint in the way required under the original design was practically an impossibility; and as this design had to be changed at great expense to the contractor, it is considered that the extra expense should be borne by the Government.



Mr. Pendergrass, in his testimony, page 106, volume 15, states that his original estimate of \$7,920 was too low; that the amount should have been placed at \$5 each for 2,544 A frames and \$12 each for 96 B frames, making a total extra cost on this item of \$13,872. Mr. Pendergrass states that he based his final estimate as near the actual shop conditions as he could get by consulting the blacksmith as to the time necessary to perform various operations.

Mr. Nutting has made a very careful estimate and concluded that the estimate of the Contractor is reasonable, if the angles were actually made in four pieces and the joints welded. If they were made in one piece, Mr. Nutting thinks that \$2.50 extra would be ample to cover all the expenses, including the substantial overhead for each frame of type A and \$6 for each frame of type B. The amount expended by the Contractor in doing this work was taken into consideration in arriving at a normal cost for the blacksmith shop, item 30, page 205 of this report. It seems that the difference between the estimate made by Mr. Nutting and the estimate made by Mr. Pendergrass is as near to the actual cost of this work as can be arrived at from the evidence. This would make \$10,529. This amount should be allowed as a part of claim 2.

The total allowance recommended under claim 2 is as follows:

Expense of fabrication in excess of normal-----	\$60, 928. 64
Extra under claim C, Appendix, page 30; adding bent angles at ends of girder at top of air chamber-----	1, 504. 00
C-7, Appendix, pages 30 and 31; extra cost account of countersink- ing 440,000 rivets-----	3, 300. 00
Material lost due to this countersinking-----	1, 003. 00
C-8, Appendix, page 31; extra cost of shop labor making bounding angles different from original design-----	10, 529. 00
	<hr/>
	77, 264. 64

The above allowance is recommended on the basis of a total departmental shop labor cost and general expense for fabricating the lock-gate material of \$16.46 a ton, for which it is believed that the Contractor is responsible, independently of any excessive demands made upon him by the inspectors or being required to fabricate the work "under requirements as to character and finish not fairly within the specifications."

As heretofore shown, the total average cost of fabricating all material passing through shop 2 for the year preceding and the year succeeding the lock-gate period was \$12.03 per ton. The changes provided for in the agreement of August 8, 1910, and other changes add \$1.80 a ton to the cost of fabricating the material. The purchase of special equipment and general expenses of castings add \$1.24 a ton. The loss of output in shop 1 affected the fabrication of the material passing through shop 2 to the extent of 69 cents a ton. The breakdowns in power house increased the cost 30 cents a ton. These added together would show \$16.06. This would show an excess cost of 40 cents a ton, under the original specifications, over all material passing through shop 2 for the year preceding and the year succeeding the lock-gate period, due to the inherent character of the lock-gate material.

The original estimate of the Contractor for fabricating this material, including sand blasting, pickling, and painting, was \$9.60 a ton, which, in view of the average price of fabricating all other material for the year preceding and the year succeeding the lock-gate



material seems to have been excessively low. If we add to this estimate the \$1.24 for special equipment and general expenses in purchasing the castings it would make a total of \$10.84, which would still seem to be very low.

The average cost per ton for fabricating all material, other than lock-gate material, passing through shops 1 and 2 for the period from December, 1909, to January, 1914, inclusive, was \$13.45 a ton. (See p. 23 of this report.) If we add \$1.24 a ton to this to cover the cost of special equipment and general expenses of castings; 69 cents a ton for general expenses due to loss of output in shop 1; and 30 cents a ton due to breakdowns in power house (shop 2), the cost per ton of the lock-gate material would be \$15.68. This would show a difference between the actual cost and this estimate of \$2.21. The \$1.43 allowed for excessive demands by inspectors taken from this would leave 78 cents as the increased cost per ton of fabricating the lock-gate material, when compared with all material going through shops 1 and 2, other than lock-gate material, from December, 1909, to January, 1914, inclusive, due to the inherent character of such material.

Under the original bid the departmental shop labor cost and general expenses for fabricating the material under item 1 would have cost \$513,426. This was increased by changes amounting to \$97,339 (see list attached to this report marked "Appendix B"), making the total for item 1 under the original bid, with the increases, \$610,765. The total cost under item 1 was \$906,707. The difference between the actual cost and the estimated cost, after making allowances for the changes, was \$295,942. This would represent the total loss to the Contractor under item 1, assuming that he has received, or will receive, in this settlement sufficient consideration for the changes made.

In his original bid the Contractor allowed 10 cents per hundred for planing the ends. This would have amounted to \$106,963.90. It is claimed by the Contractor that the principal consideration moving to him for the large increase in cost due to the changes made by the agreement of August 8, 1910, was to have this end planing waived. If the end planing was waived, as is claimed by the Contractor, this arrangement operated as a consideration to the Contractor in shop-work to the extent of \$106,963, assuming that the end planing could have been done for the estimate. If we deduct \$106,963 from \$295,942 there would be remaining, as a loss to the Contractor, \$188,979. If the Contractor has not had the consideration moving to him for waiving the end planing in the field, it will be allowed to him under claim 6, Erection, page 67 of the claim.

In accounting for the shop loss on the basis of the original bid it must not be forgotten that the interior connections were jigged in the shop, at a shop expense of \$74,776. (See par. 32 of the Goldmark agreement of Aug. 8, 1910; B-1 of the claim of the Contractor. Appendix, pp. 7 and 8; and the estimate of Mr. Pendergrass of Apr. 30, 1915, as to the cost of changes.) Also, the holes were punched small in the shop that should have been drilled in the field, at the shop cost of \$1,200. (See B-2, p. 9 of the claim, and estimate of Pendergrass of Apr. 30, 1915.)

These two operation added \$75,966 to the shop cost by transferring work that the Contractor would have been required to do in the field to the shop, and the shop loss under the original bid should be re-



duced by this amount, for the reason that it may be assumed that the Contractor received consideration and benefit in the field erection to this extent and that he was required to do this extra shopwork for this reduction of work in the field. If this had been taken care of in the original bid it would have operated to increase the original bid by the sum stated, and in accounting for the loss under the original bid it should be deducted from the amount of the apparent loss.

Seventy-five thousand nine hundred and sixty-six dollars deducted from the \$188,979, apparent loss to the Contractor in the shop work, would leave \$113,013. If we take the allowance recommended under this claim from the loss shown above under the original bid, it would leave \$35,748.36, which may be properly classed as a loss due to the low bid of the Contractor, independently of any changes or any excessive requirements made of him under the original contract or under the supplemental agreement.

The original estimate of the Contractor for fabricating the material in the shop and on which the Contractor based his bid was too low. The estimate on which the Contractor based his bid for erection, even after the transfer of \$75,966 field work to the shop, was entirely too low. It is the opinion of your committee that the estimate of Mr. Pittman as to the normal shop-labor cost of a 77-foot leaf was too low. There seems to have been a tendency on the part of the Contractor to underestimate in connection with the work of fabricating and erecting the lock-gate material. The explanation of this tendency on the part of the Contractor is found in the difference between the character of work to be done in fabricating and erecting the lock-gate material and the work that is usually and ordinarily done in the shops of the Contractor.

A considerable proportion of the loss suffered in connection with this work was undoubtedly due to errors in estimating the cost of the necessary operations to be performed in connection with the fabrication and erection of the work. The estimators probably followed too closely the usual practice in estimating for bridge and structural work, without making sufficient allowance for the difference in character between the lock-gate work and other work usually fabricated in the shop and erected by the Contractor.

It is also evident that more material was rejected under this contract than is usually rejected under other contracts, and rightly so, for the reason that it was pickled or sandblasted, and these operations were unusual in the shop where the material was fabricated. They would tend to, and doubtless did, develop defects in the material that otherwise would not have been noticed.

It also seems to be reasonably certain that the close and detailed inspection to which this material was rightly subjected developed defects in workmanship and material that would not have been detected in other material not subjected to so close and detailed inspection, and unless the right of the Commission is to be denied to make such close and detailed inspection and require such reasonable corrections as are necessary to secure first-class workmanship, regardless of what has been the usual commercial practice, some of the increased expense was undoubtedly due to rejections resulting from the discovery of defects that would have otherwise passed unnoticed. This last feature will be brought out more in detail in connection with the consideration of the claim for the value of rejected material.



The increased expense due to changes and interference by inspectors in requiring the work to be done "as to character and finish not fairly within the meaning of the specifications" undoubtedly caused delay in the shop; in fact, the only reasonable way to ascertain the increased expense is by fixing a value on the delay and interference.

The final normal cost on which the settlement is based, and with which the Contractor should be charged, is \$16.43 per ton. At \$16.43 per ton the Contractor could have fabricated with \$77,264.64, 4,702 tons of material. If this should have been added to the tonnage of shop 2 during the lock-gate period, it would have made a tonnage for shop 2 of 72,647 tons. This divided by 26 would have given a monthly tonnage of 2,794. If we should divide 4,702 tons by 2,794 it would give 1.69 months as the time the Contractor was delayed. One and sixty-nine hundredths months would be equal to 50 days, and it seems that the delay in the shop due to this cause was equivalent to 50 days.

Whether any allowance is to be made for loss of profits on 4,702 tons of material will be considered under claim 5.

To what extent the work of erection was affected by the delay in the shop, as shown above, will be considered under claim 6.

CLAIM 3, PAGE 69, BOOK OF CLAIMS.

Material rejected or put in stock on account of unreasonable inspection, \$46,735.

Under the original claim this amount was made up as follows:

600,000 pounds, at \$2.75 a hundred	\$16, 500
Excess rivets cut out, \$1,561,000 rivets, or 1,190,000 pounds, at \$2.45 a hundred	29, 155
Bolt material put in stock, 90 tons, at \$12 a ton	1, 080
Making a total of	46, 735

In the revised claim the amount is made up as follows:

600,000 pounds, at \$2.75 a hundred	\$16, 500
Excess rivets cut out, 1,458,000 rivets, or 1,267,000 pounds, at \$2.45 a hundred	31, 091
Bolt material put in stock, 90 tons, at \$12 a ton	1, 080
Total	48. 621

The increase in the rivets claimed is due to a change in the weight of the rivets cut out. In the original claim the weight of each rivet cut out was computed by the contractor at 0.76233 pound, which weight was arrived at by dividing 1,190,000 by 1,561,000. The weight of the rivets in the revised claim is taken as the average weight of the rivets paid for, which is 0.86898 pound per rivet.

In the orderly consideration of this claim the first proposition to be established is the amount of material that was rejected.

In a statement prepared by the contractor and submitted to B. F. Harrah, a member of the Commission, June 17, 1915, and introduced in evidence June 30, 1915 (General Exhibit No. 18: Exhibit to Mr. Price's testimony No. 8), the contractor summarizes the material that was rejected as follows:

	Pounds.
Scrapped due to unreasonable inspection	638. 887
Scrapped for miscellaneous reasons	286, 990
Put in stock	1, 138, 486
Total	2, 064, 363

Mr. Price made an examination of the shop books of the Isthmian Canal Commission and undertook to locate the rejections of the material made by the Isthmian Canal Commission's inspectors, where a record had been kept of such rejections, and made a list of such material, giving the dates of rejections and, where possible, a reference to the letters containing the reasons for the rejections. (See volume 18 of the testimony, Exhibit No. 8, for the list.)

From this list it appears that 917,880 pounds of material was rejected at the pickling plant on account of surface defects. It is understood that this material was replaced by the mills, and the contractor has no objections to the rejections. It also appears from this list that 447,349 pounds of material was rejected for rust pitting, surface defects, and shop errors.

Material was rejected for rust pitting, as follows:

Rejection of material at pickling plant after being subjected to the acid bath to remove the mill scale:

*Estimated weights.*

	Pounds.
Aug. 21, 1912:	
7 sheathing plates .....	17, 720
2 sheathing plates .....	4, 500
13 bent plates .....	7, 450
32 wedges .....	8, 670
1 web plate .....	610
Sept. 11, 1912:	
4 sheathing plates .....	5, 180
1 web plate .....	360
36 wedges .....	9, 950
159 frame angles .....	3, 430
Oct. 7, 1912:	
7 fillers .....	105
3 foot-walk angles .....	200
Total .....	56, 175

Material was rejected in shop and yard for rust pitting that had been finished or partially finished as follows:

July 12, 1912. Contract 4865, rejection of 1 bent plate BP17L, owing to deep rust pits on each side .....	1, 600
July 18, 1912. Contract 4855, rejection of 1 bent plate BP17R on account of rust scales and rust pits. Sand blasting did not much improve its condition .....	1, 600
July 19, 1912. Contract 4855. rejection of 2 spliceplates owing to rust pits:	
5—S24—124 pounds×5 .....	620
8—S24A—124 pounds×8 .....	992
	1, 612

July 30, 1912. Contract 4855, rejection of footwalk, fillers, and splice plates, owing to rust pits, 25 pieces, minor parts:

	Pounds.
9 FW 28 .....	165
2 FW 16 .....	460
2 FN 3 .....	35
2 FN 5 .....	31
2 FN 11 .....	32
6 FN 13 .....	25
1 S 10 .....	110
1 SP 58 .....	115
	1, 100
Aug. 12, 1912. Rejection of 1 bent plate, BP 23, owing to rust pits .....	2, 800



Aug. 16, 1912. Rejection of 4 wedges for rust pits:

	Pounds.	
6 UW—3 UW 25	375	
5 DW—1 UW 26	120	
		495

Aug. 16, 1912. Rejection of 90 bent plates, BP, owing to rust pits; all of these were sand blasted and examined carefully. Number and length of bent plates are correct—width 32 inches, gauge  $\frac{5}{8}$  inch— 65,055

Aug. 20, 1912. Rejection of 2 doubling plates, owing to rust pits:

	Pounds.	
DP 52 R	2,700	
DP 2 R	3,275	
		5,975

Aug. 24, 1912. Rejection of 5 footwalk brackets, owing to rust pits:

	Pounds.	
1 FW 19	155	
2 FW 21	95	
2 FW 21A	95	
		635

Sept. 18, 1912. Rejection of chord angles:

	Pounds.	
2 6 by $3\frac{1}{2}$ by $\frac{1}{2}$ inch by 50 feet	1,530	
1 6 by $3\frac{1}{2}$ by $\frac{7}{16}$ inches by 50 feet	675	
		2,205

Owing to corrosion and rust pits. Angles as sent from mill.

Note: This length (50 feet) is assumed.

Feb. 8, 1912. Contract 4873, rejection of bent plate, BP 24 R, owing to rust pits— 580

Total— 83,657

The subject of rust pitting is considered on pages 170 to 174 of this report, inclusive. The allowance of the amount of material contained in the bent plates is recommended for the reason that it is not considered that the evidence shows that the bent plates were rusted to such an extent as would injure them when not exposed, after they were placed in the work. Seventy-nine thousand and eight-five pounds will be allowed for 107 bent plates.

The 32 wedges rejected under date of August 23, 1912, 8,670 pounds, and the 36 wedges rejected under date of September 11, 1912, 9,950 pounds, should be paid for, as the testimony indicates that these wedges were usually planed in the field, and if this is the case the rust and surface defects would have been removed.

The rejection of the splice plates, 1,612 pounds, under date of July 19, 1912, is approved, for the reason that these splice plates are liable to be in an exposed position.

The amount of material, 1,100 pounds, rejected July 30, 1912, foot walls, fillers, etc., should be paid for.

The rejection of 11 wedges for rust pitting, 495 pounds, under date of August 16, 1912, does not appear to have been justified, and the weight of this material should be paid for.

The rejection of the doubling plates, 5,975 pounds, under date of August 20, 1912, is approved for the reason that these plates would be in an exposed position.

The material rejected August 24, 1912, footwalk brackets, 635 pounds, should be paid for.

The rejection of the chord angles under date of September 18, 1912, 2,205 pounds, is approved, for the reason that there is no evidence, or not sufficient evidence at least, to show that the inspectors were not justified in requiring these angles to be cut off.

The rejection of all sheathing plates, frame angles, and web plates is approved, for the reason that such material would be in a more or less exposed position after it is placed in the work.

The 305 pounds of material rejected October 7, 1912, should be paid for.

The total amount of material that should be paid for that was rejected on account of rust pitting is 100,240 pounds.

The Contractor agrees that the material listed below should have been rejected:

*Estimated weight.*

	Pounds.
May 12, 1911. Contract 4585, girder G5R, serial 48; all parts rejected except contra web and minor parts. This girder was rejected by Mr. Goldmark when he was in the United States in April, 1911-----	18, 000
Nov. 7, 1911. Contract 4857, rejection of bent plate BP26R owing to imperfect joint and mispunched hole—one-fourth inch out of position----	376
Jan. 9, 1912. Contract 4859, rejection of 1 web plate for frame A8—three thirty-seconds inch scant, 1 foot at top not milled-----	570
Jan. 10, 1912. Contract 4859, rejection of 1 sheathing plate DM4½. Error in laying out or milling. All holes seven-sixteenths inch out of center--	3, 400
Jan. 15, 1912. Contract 4859, rejection of 1 sheathing plate, UM25, chamfered on opposite end to that required-----	2, 800
Jan. 22, 1912. Contract 4859, rejection of 1 sheathing plate, UM36, on account of being one-half inch too short at miter end which joins the bent plate-----	3, 075
Feb. 6, 1912. Contract 5753, rejection of 1 upstream sheathing plate, UA5L, on account of error in milling the chamfer to eleven-sixteenths inch instead of seven-eighths inch, as required-----	2, 900
Feb. 8, 1912. Contract 5753 (replace material), rejection of 1 sheathing plate, DA21, milled to chamfer five thirty-second inch scant-----	4, 000
Mar. 18, 1912. Contract 4861, rejection of sheathing plate UM35R owing to bad flaw or sliver in one end. Drilled and planed-----	2, 450
Apr. 27, 1912. Contract 4861, rejection of 1 reinforcing plate miter end of girder G9L, serial 21. Although 36 holes were mispunched in the plate it was riveted in place-----	720
Apr. 27, 1912. Contract 4855, rejection of web plate at miter end girder G1 owing to bad snake or lap. Plate drilled, but not assembled-----	52
May 3, 1912. Contract 4855, rejection of 1 sheathing plate, DM42; received from mill one-half inch short of length required-----	3, 200
May 9, 1912. Contract 4855-4863, rejection of 2 sheathing plates—	
1-DM42, owing to being three-fourths inch too short; not discovered until after punching-----	3, 200
1-UMS, owing to being 4½ inches too short of required length. Mill error detected in storage yard before being sent to shop—4863----	3, 500
May 31, 1912. Contract 4861, rejection of 1 bent plate, BP15, owing to the joint being broken with milling tool-----	810
May 31, 1912. Contract 4855, rejection of 1 web plate of frame A3; 1 web three-fourths inch used in place of seven-eighths inch where there were required 2 seven-eighths inch plates-----	490
June 19, 1912. Contract 4861, rejection of 1 bent plate, BP27, owing to being scant in width three-sixteenths inch on outstanding wing-----	1, 800
June 20, 1912. Rejection of 1 bent plate, BP15R, owing to being too short to true up at milled end-----	810
June 26, 1912. Rejection of 1 upstream chord angle 8 by 8 by ¾ inch, broke during binding-----	2, 610
Aug. 1, 1912. Contract 4865, rejection of 1 sheathing plate, DM32L, owing to being seven-sixteenths inch scant of required length; practically all holes punched-----	4, 400
Aug. 2, 1912. Contract 4863, rejection of chord angle, girder G3, 8 by 8 by ¾ inch; broke while being sheared to length-----	2, 610
Aug. 6, 1912. Contract 4863, rejection of 1 doubling plate, DP18L, on account of piping detected before punching-----	1, 800
Oct. 10, 1912. Rejection of 1 upstream chord angle, 8 by 8 by ¾ inch, owing to fracture; angle broke during binding process in bulldozer--	2, 610



	Pounds.
Dec. 3, 1912. Contract 4867, rejection of 2 upstream chord angles which broke after being riveted in place; girder G11R, serial 11, girder G11L, serial 15, 8 by 8 by $\frac{3}{4}$ inch-----	5, 220
Jan. 2, 1913. Contract 4873, rejection of 2 upstream chord angles for girder G18, serial 21, 8 by 8 by $\frac{3}{4}$ inch, broke while being assembled--	5, 220
Jan. 13, 1913. Contract 4873, rejection of 2 upstream chord angles for girder G18, serial 21, 8 by 8 by $\frac{3}{4}$ inch, broke during assembling-----	5, 220
Jan. 16, 1913. Contract 4873, rejection of 1 upstream chord angle for girder G9AL, serial 28, 8 by 8 by $\frac{3}{4}$ inch; angle broke after assembling--	2, 610
Jan. 18, 1913. Contract 4873, rejection of 1 upstream chord angle for girder G18, serial 23, 8 by 8 by $\frac{3}{4}$ inch; angle broke after assembling_	2, 610
Jan. 27, 1913. Contract 4873, rejection of 1 upstream chord angle for girder G16L, serial 35, 8 by 8 by $\frac{3}{4}$ inch; angle broke during assembling-----	2, 610
Jan. 28, 1913. Contract 4873, rejection of 1 upstream chord angle for girder G12AL, serial 38, 8 by 8 by $\frac{3}{4}$ inch; angle broke after assembling-----	2, 610
Jan. 28, 1913. Rejection of 1 upstream chord angle for girder G3L, serial 37, 8 by 8 by $\frac{3}{4}$ inch; angle broke during assembling-----	2, 610
Total -----	94, 893

The general provisions in the specifications relative to quality of material and inspection, so far as applicable, are as follows:

54. All material shall be of uniform quality throughout the mass of each object and free from all defects.

It shall be inspected and tested at the place of manufacture by inspectors in the employ of the Commission and passed by them subject to restrictions hereinafter mentioned.

57. Each object made from accepted material shall be clearly and indelibly stamped by the inspector, and no material shall be incorporated into the gates or fixed parts unless it bears such stamp, but rivet bars and other small parts may be bundled or boxed with stamp on attached metallic tag.

58. Material may be rejected at any stage of manufacture, fabrication, and erection for surface or other injurious defects, either previously existing or developed in working, although it bears the above-mentioned stamp, and shall be replaced by the contractor at his own cost for material and labor.

76. A variation of more than  $2\frac{1}{2}$  per cent from that specified in the cross section or weight of any piece of steel will be sufficient cause for its rejection, except in the case of plates over 24 inches wide. These last may be accepted if they meet the following requirements which are to apply to single plates:

The minimum thickness at edges of plates must be not more than 3 per cent below the ordered thickness. The weight must not be more than 3 per cent less than the nominal weight nor exceed it by more than the percentages given in the following table:

Thickness of plate.	Above 24 and below 75 inches.	Width of plate.	
		75 to 100 inches.	Over 100 inches.
$\frac{3}{8}$ inch.....	7	10	13
$\frac{7}{16}$ inch.....	6	8	10
$\frac{1}{2}$ inch.....	5	7	9
$\frac{9}{16}$ inch.....	$4\frac{1}{2}$	$6\frac{1}{2}$	$8\frac{1}{2}$
$\frac{5}{8}$ inch.....	4	6	8
Over $\frac{5}{8}$ inch.....	$3\frac{1}{2}$	5	$6\frac{1}{2}$

78. Plates and shapes must be free from slag, foreign substances, brittleness, hardp spots, laminations, sand or scale marks, snakes, pits, and defects generally. Shapes must also be free from defective sections, shaded backs, grooved fillets, imperfect edges, crookedness, etc.

The material was all inspected at the mills and stamped as required under paragraph 57.

Paragraph 58 gave the Isthmian Canal Commission's inspectors authority to reject material at any stage of manufacture, fabrication, and erection for surface or other injurious defects, either previously existing or developed in working.

It seems to your committee that, in order to justify the rejection of material after it had been accepted at the mill, the defects on which the rejection was to be made should be injurious. It is probable that this is the view the inspectors of the Isthmian Canal Commission undertook to enforce, but it is the opinion of your committee that, as to the material listed below, the defects described were not injurious and that the material should have been accepted. The list of such material is as follows:

June 28, 1911. Contract 4851:	Pounds.
1-UM26 -----	2, 875
1-UC27 -----	4, 200
	<hr/> 7, 075

Rejected 2 upstream sheathing plates because of being one thirty-second inch scant of required gauge.

Feb. 8, 1912. Contract 4859, rejection of 1 sheathing plate UM6L milled at chamfer one-sixteenth inch scant-----	2, 600
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Mar. 15, 1912. Contract 5749 (replace material), rejection of wedge DW35L owing to not coming up to our requirements in weight or gauge-----	150
--	-----

Apr. 9, 1912. Contract 4857½, rejection of 2 bent plates BP9 owing to using seven-eighths-inch die for three-fourths-inch hole, punch three-fourths inch-----	1, 040
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Apr. 13, 1912. Contract 4861, rejection of 1 sheathing plate DM42L owing to excess in weight and gauge: Scale 3340, 0.510K; max., 3289, 565; correct, 0.500-----	3, 200
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May 2, 1912. Rejection of 6 wedges:

	Pounds.
1-DW21R -----	145
4-UW41R -----	540
1-UW41L -----	135
	<hr/> 820

Gauge eleven-sixteenths inch instead of three-fourths inch, as required. Wedges will not true up.

June 10, 1912. Contract 4861, rejection of 5-foot walk angles FW3 R L owing to holes for bracket being countersunk on inside of vertical leg of angle-----	3, 450
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June 17, 1912. Contract 4865, rejection of 1 sheathing plate DA4½ owing to being chamfered below the limit allowed, one thirty-seconds inch--	3, 800
---	--------

June 20, 1912. Rejection of 1 footwalk bracket FW7 owing to 8 holes, which take the bracket connections, being countersunk-----	926
---	-----

July 18, 1912. Contract 4863, rejection of end web plate of girder G6 owing to being scant in width three-eighths inch—checked before being drilled-----	4, 170
--	--------

Dec. 3, 1912. Contract 4873, rejection of 2 sheathing plates DA5-A, error in punching group of 5 holes; should be blank-----	6, 850
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Jan. 2, 1913. Contract 4873, rejection of 2 sheathing plates UM33 owing to error in punching 16 holes, which were not required, in each plate; holes were screw plugged before calling inspector's attention to error--	7, 500
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Feb. 6, 1911. Contract 4845, rejected by G. F. Guynn:

	Pounds.
1 plate DM17R owing to 4 plugged holes-----	3, 300
1 plate DM17R owing to 8 plugged holes-----	3, 300
	<hr/> 6, 600

Total -----	48, 181
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Allowance should be made for the material listed above.



On May 17, 1911, material was rejected, as follows:

Contract 4847:	Pounds.
Girder G 19, serial 65, rejected 2 reinforcing plates at quoin end owing to a number of oblong holes-----	1, 430
Girder G 12 L, reinforcing plates at quoin end-----	4, 900
	<hr/> 6, 330
Contract 4845, girder G 20, serial 45, rejected 2 reinforcing plates at quoin end, owing to a number of oblong holes-----	1, 430
	<hr/> 7, 760

(See list of material rejected, vol. 18 of the testimony, Exhibit No. 8, p. 3.)

The following letters from Mr. Price to Mr. Hammer give the reasons for rejection of this material:

[Letter No. 1.]

Referring to girder G 20, serial 45, shop order 4845, I have rejected 2 reinforcing plates at quoin end of girder, owing to a number of oblong holes in frame A connections, also 2 small filler plates, which are riveted on center web for non-watertight connections.

[Letter No. 2.]

Referring to girder G 19, serial 65, shop order 4847, I have rejected 2 reinforcing plates at quoin end of girder, owing to a number of oblong holes in frame A connections. These are to be replaced and properly drilled.

Referring to girder 12 L, serial 75, shop order 4847, I have rejected the end web plate and 2 reinforcing plates at quoin end of girder, owing to a number of oblong holes in frame A connections.

These letters do not give the number of oblong holes or the extent to which the holes were oblong.

Mr. Price, who made the rejections, was working to very close limitations, as has been heretofore shown, and it is probable that in this particular he was more severe than was justified by the usual practice in connection with such work. (See testimony of Mr. John Ostrom heretofore quoted in connection with the accuracy which was being required in the work; see also testimony of Mr. T. B. Monniche, vol. 37, pp. 14, 15, and 16.)

It is the opinion of your committee that the rejection was not authorized, and allowance should be made for the amount of material involved.

The following material was rejected for surface defects:

Dec. 11, 1911. Contract 4857, rejection of center web of girder G 2, surface defects; assembled but not riveted-----	4, 140
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The statement of this rejection shown above contains all of the information that is found in Mr. Price's letter to Mr. Hammer, making report.

In a letter from Mr. Price to Mr. Hammer, dated December 6, 1911, found in Appendix to his report, page 40, he states:

In connection with the pickling plant, I must call your attention to the length of time material is allowed to remain exposed to the weather after being pickled. The output of the pickling plant is evidently much in excess of the output of the shop at present, and especially so as regards plates. One or more piles of plates have remained in the yard exposed to the weather since being pickled for about six weeks, and several piles have remained there for two, three, and four weeks.

On December 12, 1911, after the rejection of the above web plates (in a letter to Mr. Hammer found in Appendix to Mr. Price's report, p. 41), Mr. Price states that:

I wish to call your attention to conditions as to rusting of material after being pickled, and also to conditions of certain finished members, material for which has been pickled before fabrication.

The material remains in the pickling yard for several days, and in many cases for several weeks exposed to the weather after being pickled, and after fabrication the finished members remain in the shipping yard in many cases for several weeks exposed to the weather before painting.

From these letters it is quite probable that the rejection of this material was made by Mr. Price on account of its rusty and probably pitted condition, although he does not so state.

In the absence of any evidence to show that the contractor objected to this rejection at the time it was made, and of any evidence to show the exact condition of this material at the time it was rejected, it will be presumed that the action of the inspector in making the rejection was authorized.

Jan. 18, 1912. Contract 4857, rejection of 1 end web plate, girder G 17, owing to surface defects; plate was punched but not assembled-----pounds\_\_ 3, 468

Mr. Price, in his letter of January 18, 1912, reporting this rejection to Mr. Hammer, states:

Referring to end web or sketch plate, five-eighths inch thick, for girder G 17, contract 4857½, which was rejected owing to surface defects:

"Information as to heat number was requested by Mr. Barr, of Jones & Laughlin. The heat number stamped in this plate is 11133. This plate was punched but not assembled."

It is probable, from this letter, that the surface defects for which this plate was rejected was one existing in the plate at the time that it came from Jones & Laughlin. This would seem to be indicated from the request of Mr. Barr, of Jones & Laughlin, for the heat number of the plate.

In the absence of any evidence that the contractor objected to this rejection at the time it was made, or any evidence to show that the defect was not an injurious one, it will be presumed that the judgment of the inspector in rejecting it was based upon the fact that the surface defect was an injurious one, and the rejection is approved.

May 27, 1912. Rejection of 1 bent plate, owing to surface defects, detected before being subjected to acid bath at pickling plant (see Cofrode's pickling-plant book)-----pounds\_\_ 340

In a letter of Mr. Price to Mr. Hammer, dated May 27, 1912, he states the reasons for this rejection as follows:

I wish to advise you that one bent plate was rejected at the pickling plant owing to surface defects. The defects were detected by Inspector Cofrode before the plate was subjected to the pickling process. Inspector's stamp No. 115. Carnegie heat No. 27616.

It is believed that the action of the inspector in rejecting this material was justified in the absence of any testimony as to the specific causes of rejection or any objections on the part of the Contractor to the rejection at the time it was made.

May 31, 1912. Contract 4855, rejection of 1 splice plate, S 54, owing to surface defects-----pounds\_\_ 90



Under date of June 7, 1912, in Mr. Price's report to Mr. Hammer, he states his reasons for this rejection as follows:

I wish to submit the following report from Mr. Hurlston regarding splice plate S 54 A:

"I have rejected one splice plate marked S 54 A,  $19\frac{1}{4}$  by  $\frac{5}{8}$  inch by 2 feet  $2\frac{7}{8}$  inches, contract 4855, for having bad surface, being badly pitted with cinders."

It is the opinion of your committee that the material should have been rejected.

June 20, 1912. Contract 4863, rejection of 1 sheathing plate UC 25 owing to surface defects -----pounds-- 4,500

In a letter dated June 20, 1912, from Mr. Price to Mr. Hammer, he states the reason for this rejection as follows:

I wish to call your attention to conditions of surface defects of one upstream sheathing plate UC 25, contract 4863, as reported by Mr. Hurlston:

"I have held up for your approval or rejection sheathing plate US 25, contract 4863, for having a flaw or scab in end of plate, as per sample."

The flaw or piping referred to by Mr. Hurlston is at the end of plate at the center joint. Its dimensions are 3 inches wide by 6 inches long by a full one-eighth inch deep.

The plate is drilled, machined, and finished.

I consider this defect sufficient cause for rejection, and have therefore rejected the plate.

It is not believed to be probable by your committee that the defect as described was so injurious as to justify a rejection of the material after it was fabricated. An allowance for the value of this material should be made.

Aug. 20, 1912. One doubling plate, DP 26, rejected owing to surface defects -----pounds-- 2,300

In a letter of August 20, 1912, to Mr. Hammer, Mr. Price states the cause of this rejection as follows:

One DP 26 rejected on account of mill surface defects.

In the absence of any evidence to the contrary or any objections on the part of the Contractor to the rejection at the time it was made, it will be presumed that the surface defects were such as to injure the material, and also that the material was probably replaced by the mill without cost to the Contractor. No allowance should therefore be made on this item.

Oct. 12, 1912. Contract 4867, rejection of 1 end web plate for girder G 19. owing to surface defects; detected before punching-----pounds-- 2,800

In a letter to Mr. Hammer, dated October 12, 1912, Mr. Price states his reason for this rejection as follows:

I wish to advise you that I have rejected one end web plate for girder G 19, contract 4867, owing to surface defects which were detected when the plate was laid off but before being punched.

No work was done on this plate, except laying off, and it is probable that it was replaced by the Contractor without charge. The surface defects were evidently mill defects, and it is presumed, in the absence of any evidence to the contrary, that they were sufficiently injurious to justify a rejection.

Feb. 6, 1911. Contract 4845, rejected by G. F. Guynn :

	Pounds.
1 plate DM 44, owing to scale on surface-----	2, 600
1 plate UC 11, owing to drill and hammer marks-----	3, 500
1 plate UC 11, owing to drill marks-----	3, 500
1 plate UC 20, owing to scale on surface-----	3, 400
	<hr/>
	13, 000

In a letter from Mr. Geo. F. Guynn to Mr. Hammer, under date of February 6, 1911, Exhibit No. 15 of Mr. Neeld's testimony, he states:

The following sheathing plates have been rejected account of surface defects: \* \* \*

One plate DM 44, rejected on account of scabs on surface.

One U C 11, rejected on account of drill marks, and the surface badly marred on account of hammering same.

One U C 11, rejected on account of drill marks.

One U C 20, rejected on account of scabs on surface. \* \* \*

Two plates, D M 17 R, plugged holes, have heretofore been allowed.

The size and character of the scabs on the surface of the material are not stated, but in the absence of any evidence that the Contractor objected to the rejection at the time and of any evidence as to the character of the scabs, it will be presumed that they were of such character as to be injurious to the material.

In relation to one of the U C 11 plates, rejected on account of drill marks, Mr. Guynn states:

One upstream sheathing plate, mark U C 11, was rejected on account of having 49 drill marks, ranging from one-sixteenth inch to one-quarter inch deep and from one-eighth inch to three-eighths inch in diameter, due to carelessness in drilling.

The above plate was underneath the plate that was being drilled.

Another plate, mark U C 11, was rejected on account of drill marks. In the absence of any evidence to the contrary, it is believed that the drill marks were of such character as to be injurious to the material. It is thought by your committee, therefore, that the rejection was properly made.

The material rejected for surface defects, considered in detail on pages 225, 226, 227, 228, and 229 above, amount to 31,038 pounds. It appears that 26,538 pounds were properly rejected and that there should be an allowance for the value of 4,500 pounds rejected on this account.

Material was rejected for piping as follows:

Jan. 31, 1912. Contract 5749 (replace), rejection of 1 downstream sheathing plate, DMIL, on account of piping-----pounds-- 4,200

In a letter to Mr. Hammer, dated January 31, 1912, Mr. Price states:

I wish to advise you that I have rejected one downstream sheathing plate D M I L; contract 5749, on account of piping.

This plate is to replace material on contract 4849 which was lost on the *Moldegaard*.

In the absence of any evidence to the contrary, it must be presumed that the piping was injurious to the material, and that the rejection was properly made.

Feb. 22, 1912. Contract 4859, rejection of bent plate, finished BP 18 R, on account of piping, and also on account of poor workmanship--pounds-- 1, 550



In a letter to Mr. Hammer, dated February 22, 1912, Mr. Price states his reason for this rejection as follows:

I wish to call your attention to defective material in end plate riveted on bent plate BP 18 R, contract 4859, and I quote Mr. Hurlston's report on this subject. After careful examination of this plate, and finding the piping to be about 4 inches in width and running to a depth of 5 inches, I rejected the plate. Besides piping in the end plate, the member was carelessly constructed, as noted in report mentioned. A steel scale, one-sixteenth inch thick, was moved with ease between the end and bent plate its whole length, 12 inches, and an ordinary putty knife was placed between the end and bent plates between the first and second rivets, showing the two plates were not in contact.

I am holding up bent plate, BP 18 R, contract 3859, for your approval or rejection. The end plate is piped at one end, extending back about 6 inches. There is also a space of about one-sixteenth inch between the end plate and the bent plate, which extends about 12 inches.

It is considered by your committee that this rejection was properly made.

Apr. 5, 1912. Contract 4859, rejection of 1 doubling plate, DP 29 L, owing to piping; this plate was punched, drilled, and finished-----pounds-- 3, 200

In a letter from Mr. Price to Mr. Hammer, dated April 5, 1912, he states his reason for the rejection of this plate, as follows:

I wish to inform you that I have rejected one doubling plate, DP 29 L, contract 4859, owing to the plate being badly piped. The piping extends for 3 or more feet along the edge of the plate, and is open 6 or more inches back from the edge. This plate was punched, planed, and finished, but the piping not discovered until inspected by Mr. King. The plate was not subjected to the pickling process.

I would advise more careful inspection at the mill relating to piping.

It is considered that this rejection was properly made.

July 29, 1912. Contract 4865, rejection of sheathing plate, DM 42 L, owing to piping. Not detected until plate was planed and punched---pounds-- 3, 200

In a letter from Mr. Price to Mr. Hammer, dated July 29, 1912, he states his reason for this rejection, as follows:

I wish to advise you that I have rejected one downstream sheathing plate, DM 42 L, contract 4865, owing to piping. This defect was not detected until the plate was planed and punched.

There are two distinct piping at one corner of the plate which extend several inches on end and sides. These defects are considered sufficient cause for rejection.

It is considered that this plate was properly rejected.

Aug. 7, 1912. Contract 4863, rejection of 1 doubling plate, DP 18 L, owing to piping -----pounds-- 1, 800

This appears to be covered by a letter from Mr. Price to Mr. Hammer, dated August 6, 1912, which reads as follows:

I wish to advise you that I have rejected one doubling plate, DP 18 L, contract 4863, on account of piping, about 3 inches in length on one end of plate. This defect was detected after the plate was laid out, but before it was punched.

In the absence of any evidence to the contrary it must be presumed that this defect was injurious to the plate, and that it was properly rejected.

Aug. 22, 1912. Contract 4863, rejection of 1 reinforcing plate girder, G 6 L, serial 34, quoin end, owing to piping; not detected until girder was machined and finished-----pounds-- 816

In a letter to Mr. Hammer of August 22, 1912, Mr. Price states:

I wish to advise you that I have rejected one reinforcing plate on quoin end of girder, G 6 L, serial 34, contract 4863, on account of piping. The girder was machined and finished before the piping was detected.

In the absence of any evidence to the contrary it is presumed that this piping was injurious to the material and the rejection was properly made.

Sept. 18, 1912. Rejection of 20 end reinforcing plates for girders, owing to piping; detected after plates were planed and punched, but before assembling-----pounds-- 14, 000

In a letter of Mr. Price of September 18, 1912, he states the reason for this rejection, as follows:

I wish to advise you that I have rejected 20 end reinforcing plates for girders on account of piping. This defect was not discovered until after the plates were punched and planed.

In the absence of any evidence to show that the contractor objected to this rejection at the time it was made or any evidence to show that the piping was not injurious to the material, the judgment of the inspector that the extent of the piping was sufficient cause for the rejection of the material will be accepted. The material should have been rejected.

The following material was rejected on account of slivers on edge of plates:

Jan. 21, 1911. Contract 4845-47, rejected 1 downstream sheathing plate, DA7, on account of sliver on edge of plate-----pounds-- 3, 200

The only reason appearing in the letter of Mr. Guynn to Mr. Hammer, of January 21, 1911, giving the cause for this rejection, is that it was rejected on account of sliver on edge of plate.

In the absence of any objections to this rejection at the time it was made, or of any specific evidence as to the insufficiency as to the cause of the rejection stated, it will be presumed that the sliver was injurious to the plate, and that it was properly rejected.

Feb. 6, 1911. Contract 4845, rejected by G. F. Guynn, 1 plate, DA7, owing to sliver on edge of plate-----pounds-- 3, 200

The reason given by Mr. Guynn for the rejection of this plate, in his letter of February 6, 1911, to Mr. Hammer, was on account of the sliver on the edge of the plate. Mr. Neeld, who was the manager of the Rankin shop at that time, does not have any recollection about this rejection. (See testimony of Mr. Neeld, p. 50.)

In the absence of any evidence to the contrary, it is presumed that the sliver was of sufficient extent to be injurious to the plate. The rejection is, therefore, approved.

The following rejections were made for miscellaneous reasons, principally as to the accuracy of the dimensions of the members:

Dec. 12, 1911. Contract 4857, 6 fillers:	Pounds.
3-C 158, 14 by 5/16 inch by 9 feet 9 5/8 inches, equals 145 pounds by 3--	435
3-D 158, 14 by 3/16 inch by 8 feet 7 1/4 inches, equals 77 pounds by 3--	231

On December 12, 1911, Mr. Price wrote to Mr. Hammer, giving his reasons for the rejection of these filler plates, which letter reads as follows:

I wish to report that I have rejected the following filler plates on account of being scant in width, contract 4857, bent plates BP 37 and 38, sheet 158:



Three fillers 14  $\frac{5}{16}$  by  $\frac{5}{16}$  inch by 9 feet 9  $\frac{5}{8}$  inches, assembly mark C 158; three fillers 14  $\frac{5}{16}$  by  $\frac{3}{16}$  inch by 8 feet 7  $\frac{1}{4}$  inches, assembly mark D 158; bolted for shipment.

These plates were rejected on account of being one-fourth inch scant of width at bearing edge of plate connecting with sheathing plate.

It appears that the filler plates are entirely covered and that they have no value in taking stress, being used merely as fillers. The small difference between the actual and theoretical width of these plates would not constitute, in the opinion of your committee, an injurious defect, and the value of the material contained in the rejected filler plates should be allowed.

(See sketch prepared by Mr. Embree in miscellaneous data file.)

May 3, 1912. Contract 4855, rejection of 1 end sketch web-plate girder

G1A, scant in dimensions as to length and breadth-----pounds-- 5,210

In a letter dated May 3, 1912, to Mr. Hammer, Mr. Price gives his reasons for the rejection of this web plate as follows:

I wish to advise you that one end sketch web plate for girder G1A, contract 4855, was rejected on account of being scant in dimensions both as to length and width. I submit Mr. Harber's report on this matter:

"The following covers one sketch web plate for water-tight girder G1A (rejected) on account of being too narrow at intervals, also short for length to enable good results. Plate 84 by  $\frac{1}{8}$  inch by 22 feet  $1\frac{3}{4}$  inches. Heat No. 11360 I. C. C. 20."

I consider it well to call the attention of the mill to these discrepancies.

In a note on the face of the above-quoted letter Mr. Hammer states:

Reject plate and call the mill's attention to material being received too scant in dimensions (length and width).

These errors in dimensions are considered as good cause for the rejection of this plate, and the rejection is approved.

June 26, 1912. Contract 4861, rejection of 2 bent plates BP15R, evidently shipped from the mill too short and appear to have been heated and drawn out -----pounds-- 1,620

In a letter to Mr. Hammer, dated June 26, 1912, Mr. Price gives his reason for this rejection as follows:

I wish to call your attention to conditions of bent plate B P 15 R, contract 4861, as reported by Mr. Hurlston:

"I have held up in shop two bent plates B P 15 R for your approval. These plates were evidently shipped from the mill short, as same would not true up in the milling. The plates now appear as if they had been heated and drawn out to the following thicknesses: No. 1 B P 15 R, 635, 630, 598; No. 2 B P 15 R, 545, 550, 578, 575. These plates should caliper 0.687 or  $\frac{1}{8}$  inch."

On June 20 I advised you in letter of that date that I had rejected one bent plate B P 15 R on account of being too short to true up. This refers to No. 2, as reported by Mr. Hurlston. No. 1 was held for later decision.

The following note was placed on the above letter by Mr. Hammer:

Price was instructed verbally to reject plate 1 July 1, 1912.

It is the opinion of your committee that this method of correcting defects in the plate without calling the commission's attention to the method proposed, so that its inspectors might witness the process, was not justified. The rejection also appears to have been proper under the circumstances and for the reasons stated.

		Pounds.
Aug. 16, 1912. Rejection of 9 wedges, 2 DW one-eighth inch short:		
1 UW 42	-----	150
1 UW 44	-----	125
3 DW 8	-----	330
1 DW 25	-----	110
3 DW 32	-----	375
		<hr/>
		1, 090

It is not considered that this is sufficient cause for the rejection of these wedges, and the amount of material contained in them should be paid for.

Nov. 29, 1912. Contract 4867, rejection of 2 upstream chord angles for girder G8, serial 9, owing to error in milling; all holes reamed full size; three-sixteenths inch out-----pounds-- 5, 220

In a letter from Mr. Price to Mr. Hammer, dated November 29, 1912, Mr. Price states his reason for this rejection as follows:

I wish to advise you that I have rejected downstream chord angles on girders G8, serial 9, contract 4867. These angles were milled too short, the rivets were backed out, and the angles moved forward about three-sixteenths inch, making the holes through the web of girder three-sixteenths inch out of center, which was considered sufficient cause for rejection.

The fact that all holes in the center web, after being reamed to full size, were three-sixteenths inch out of center seems to your committee to have been sufficient cause for the rejection of the material. This rejection is therefore approved.

Jan. 16, 1913. Contract 4867, rejection of 4 splice plates S24, owing to light gauge, seven-sixteenths inch instead of one-half inch, as required-----pounds-- 100

In a letter from Mr. Price to Mr. Hammer, dated January 16, 1913, he states:

I wish to advise you that I have rejected, owing to being one-sixteenth inch light in gauge, 4 splice plates S24, contract 4867. These plates are located in the seventh panel on downstream side of leaf. The plates gauge seven-sixteenths inch instead of one-half inch, as called for on drawing.

Mar. 16, 1911. Contract 4845, several water-tight frames rejected:		Pounds.
Assume 5 at 1,200 pounds each	-----	6, 000
1 sheathing plate (assumed weight)	-----	3, 500
1 nonwater-tight frame web plate (assumed weight)	-----	530
1 staple for water-tight frame (assumed weight)	-----	255
		<hr/>
		10, 285

The records do not show very definitely why the water-tight frames were rejected. There is a notation in Mr. Wheatcroft's shop books showing that some of the water-tight frames cracked at the time they were being electrically welded.

In Mr. Guynn's letter of February 28, 1911, found in volume 6 of the testimony, Exhibit 3, he states:

Twenty-two water-tight frames have been riveted and six assembled for riveting. The corners and butts of these frames have been welded by the electric process of welding. The welding looks very unsightly, and the corners and butted ends of the material are roughly cut close to the rivet holes, and, in my opinion, this method of welding will not give satisfactory results when subjected to a high head of water pressure. At the present writing the corners are being welded by angle smiths in a workmanlike manner, and I think the same will be entirely satisfactory.

The water-tight frames are undoubtedly a part of the material that was scrapped when the change was made in the bounding angle of these frames. (See pp. 63, 64, and 65 of the testimony of Mr. Pendergrass, vol. 15, and Exhibit No. 25 in the testimony of Mr.



Pendergrass.) In this testimony, page 65, it appears that the water-tight diaphragms made in four parts, either butt calked or electric welded, were scrapped. An allowance will be made for this material as a separate item to cover the value of the scrapped material, as shown in the testimony of Mr. Pendergrass, page 121.

The sheathing plate, the nonwater-tight frame web plate, and the staple angle for water-tight frame do not appear to be sufficiently identified from the records to enable your committee to determine the specific causes of rejection. The evidence is, therefore, not sufficient to justify your committee in saying that the Isthmian Canal Commission's inspectors were not authorized in the rejection of these plates. The rejection of one sheathing plate, one nonwater-tight frame web plate, and one staple for water-tight frame is therefore approved, and as stated above before an allowance for the amount of the estimated weight of the water-tight frames will be made when making allowance for the material scrapped in connection with the way in which the bounding angle for the water-tight frames was finally fabricated.

Apr. 17, 1911. Contract 4845, 5 sheathing plates rejected. Erection marks not designated (assumed weight 3,500 pounds each) — pounds — 17, 500

The five sheathing plates are referred to in a report of Mr. Crane to Mr. Hammer, dated April 17, 1911. The statement is made therein, in connection with the rejection, that—

Five sheathing plates have been rejected since last report of March 31, 1911.

On April 15, 1911, Mr. Crane stated—

About crimped plates, both Mr. Hurlston and Mr. Wheatecroft remained until about 7.30 inspecting these plates, rejecting 5 of the 16 plates. These 5 plates are in the shop, but hope to get them ready by noon for shipment.

This would seem to indicate that the plates were not absolutely rejected, but were merely held up for correction when reported to Mr. Hammer. No allowance will therefore be made for what seems to have been listed as an absolute rejection, but which, in all probability, was nothing more than a rejection of the plates when presented, with the understanding that they would be corrected and subsequently submitted.

May 1, 1911. Contract 4847, upstream chord angles ————— pounds — 2, 610

In a letter of Mr. Crane, dated May 1, 1911, he states—

The upstream angles of a girder, contract 4847, were rejected.

Your committee has been unable to find where the records of the Isthmian Canal Commission indicate the cause of the rejection of these chord angles, neither does the testimony give the reason.

In the absence of any evidence to explain the cause for the rejection of these angles, your committee does not feel justified in concluding that the rejection must have been erroneously made.

Material was rejected for errors in punching and spacing of holes as follows:

Mar. 13, 1912. Contract 4859, rejection of the upstream chord angles girder G 23, serial 51, holes in outstanding leg three-eighths inch out of center in many cases ————— pounds — 2, 630

In a letter to Mr. Hammer, dated March 13, 1912, Mr. Price states the reason for this rejection as follows:

I wish to report that acting upon your instructions the upstream chord angles of girder G 23, serial 51, contract 4859, were rejected; the holes in the

outstanding leg to take the sheathing plates being out of center in many cases as much as three-eighths inch. These angles have been removed and replaced with others which match the holes in the sheathing plates within three thirty-seconds inch in the most aggravated case. As reported by Mr. Harber.

This seems to be sufficient reason for the rejection of this material, and requiring the angle to be cut off and replaced. The action of the inspector is therefore approved.

July 19, 1912. Contract 4855, rejection of 2 splice plates, owing to mis-punched holes (2—SP 21, 120 by 2) -----pounds-- 240

In a letter to Mr. Hammer, dated July 19, 1912, Mr. Price states that—

I wish to advise you that I have rejected two splice plates, contract 4855, on account of \* \* \* mispunched holes. Two splice plates, SP. 21, rejected on account of mispunched holes.

In view of the evidence showing the extreme accuracy in the punching of the holes, it is probable that this rejection was unauthorized. The value of the material involved will be paid for.

Dec. 1, 1910. Contract 4845, girder G 13, serial 14, assembled in shop; two upstream chord angles rejected owing to unfair holes----pounds-- 4,385

In a letter to Mr. Hammer, dated December 1, 1910, Mr. Guynn states—

The following is a list of material being worked in shop for contract 4845, 54-foot 8-inch gates:

One girder, mark G 13, serial 14, assembled in shop with the exception of the upstream chord angles, which have been removed on account of unfair holes. New angles will be substituted in the place of the ones removed.

This was a part of the first work that was fabricated, and while it may be that too great accuracy was being demanded as to the cleaning up of the holes, your committee does not feel warranted in holding in the particular instance cited that the evidence is sufficient to justify the conclusion that the action of the inspector was unwarranted and unnecessary to secure first-class workmanship.

The rejection is approved.

The action is, to some extent at least, supported by the fact that subsequently Mr. Goldmark rejected practically all the material in one girder, 18,000 pounds, and that this rejection has been concurred in by Mr. Wolfel. It has also been found as a fact in this report that the fabrication of this work in the beginning was not entirely satisfactory.

Apr. 1, 1911. Contract 4845, rejected owing to unfair holes:

	Pounds.
Girder G 13 R, serial 20, u. s. chord angles-----	4,385
Girder G 13 L, serial 23, d. s. chord angles-----	2,170
Girder G 13 R, serial 31, u. s. chord angles-----	4,385
Girder G 14 L, serial 15, d. s. chord angles-----	2,170
Girder G 14 R, serial 19, d. s. chord angles-----	2,170
Girder G 14 L, serial 16, u. s. chord angles-----	4,385
	<hr/> 19,665

In a report of Mr. Crane to Mr. Hammer, dated March 20, 1911, in reference to girder G 13 R, serial 20, above, he states:

Downstream angle, unfair holes 113. Upstream angle, unfair holes 220. Rejected both up and down stream angles.

NOTE.—Reinspected 3-24-11. Rejected finally upstream angle (see letter 3-26-11).



The letter of March 26, 1911, referred to as showing the final action on this girder, states:

Girder 13 R, serial 20, "white" marks: First inspection gave upstream angles 220 bad holes; downstream angles 113 bad holes. Tried plate; could not fit up with one-half-inch bolts on upstream angles, but downstream angles were very good. Rejected upstream angles.

This seems to your committee to be sufficient cause for the rejection of these angles. The punching should at least have been good enough to enable the Contractor to bolt up with five-eighth-inch bolts; otherwise it is probable that in reaming out, so that the holes would clean up, too much material would be removed from the angles. (Upon this question see the testimony of Mr. Monniche, pp. 13, 14, 15, 16, and 17.)

In the report of Mr. Crane to Mr. Hammer, dated March 24, 1911, in relation to girder 13 L, serial 23, he states:

Downstream angles, unfair holes 161; upstream angles 20. Tried plates; 116 plus 86 bad holes. Rejected downstream angles.

NOTE.—Rejected second inspection also.

The extent to which the holes were unfair on a trial of the plates is not stated. It seems, however, that the number of holes that were bad from the trial with the plates is such as to justify the conclusion that the punching had not been done with reasonable accuracy.

Girder 13 R, serial 31, above:

In a letter dated March 20, 1911, Mr. Crane reports to Mr. Hammer on this girder as follows:

Downstream, unfair holes ———; upstream, unfair holes ———.

NOTE.—Retried with plate and rejected the second time, G 13 R, 31.

In a letter dated March 24, 1911, Mr. Crane states, in reporting to Mr. Hammer:

Girder G 13 R, serial 31. Upstream, unfair holes, 97. Reinspected and rejected on trial with plate. Upstream angles rejected finally.

The extent to which the holes were cut is not shown, and of course it is simply a question as to rejections of the inspectors as to whether or not the holes were sufficiently out on the trial with the plates to make it undesirable to accept the angles and attempt to incorporate them into the work with corrections in the size of the holes, so as to make the proper percentage of them clean up. As the plates were actually tried on these angles and the results found to be sufficient to justify a rejection, your committee is not in a position to determine with certainty that the holes in these angles were not sufficiently bad to justify a rejection, although it is probable from the testimony in connection with the degree of accuracy that was being required at this time that the rejection of the angles, under the circumstances, might have been due to unusually close inspection, and possibly to unnecessary accuracy.

It may have been that it was entirely proper to pass the angles and put the work of cleaning up the holes by enlarging them in the field upon the Contractor. It is not believed, however, that the facts are so clear in this case as to justify payment for the material rejected on this account.

In relation to girder 14 L, serial 15, Mr. Crane states in a letter to Mr. Hammer, dated March 20, 1911, that:

Downstream angles, unfair holes, 190; upstream angles O. K. Rejected downstream angles.

NOTE.—Rejection, second inspection.

In a letter of Mr. Crane to Mr. Hammer, dated March 26, 1911, he states:

Girder G 14 L, serial 15, "white" holes, 190 bad on downstream angles. Reinspected, tried plate DM-24, which followed "white" marks; only 7 good holes. Rejected on second inspection.

This rejection seems to have been justified on account of careless punching.

In a letter from Mr. Crane to Mr. Hammer, dated March 24, 1913, he states:

Girder G 14 R, serial 19, downstream angles, unfair holes, 156; upstream angles, unfair holes, 6. Tried plates. One plate, all bad holes. Rejected downstream angles. Rejected on second inspection when plate was tried on.

In a letter from Mr. Crane to Mr. Hammer, dated March 20, 1911, he states:

Girder 14 L, serial 16. Downstream angles, unfair holes 41; upstream angles, 118. Rejected upstream angles.

The facts do not show that these angles were subjected to a second inspection by having the plates tried on them. It is probable that the angles were taken off without question upon the condition being exhibited to the Contractor.

The amount of material lost on this account should not be paid for, unless it is to be concluded that all of the rejections in connection with the punching of the material were unauthorized, due to close and unreasonable requirements as to the accuracy demanded in the spacing of the holes. It is not believed that this view is correct, as the great number of unfair holes found in these angles would indicate, at least, that there must have been something wrong with the templets or there must have been careless work done on the angles above considered, unless it is to be concluded that holes out the very least bit were considered unfair. This is a part of the material that was fabricated by punching the holes the size called for in the specifications and with the wooden templets. It is also a part of the work that is referred to in the letter of Mr. Crane of April 22, 1911, found in Mr. Goldmark's report, page 179. It is also a part of the work that was done in the same manner as that referred to in Mr. Goldmark's testimony, pages 32 and 33, in which he states:

Q. Did you find from personal experience with Mr. Hammer in connection with the execution of this contract that he was inclined, where a matter was left to his judgment as to what would be first-class workmanship, to make close decisions against the contractor?—A. I had little opportunity of observing that directly. I was only there once or twice, and I had to agree with him in his main contentions. I did ultimately relax the specifications somewhat in passing some of the material; but I can not say, in the main, things that he could very well, as far as I know (I do not know; that is about it), have passed those things without question (sic).

Q. Can you give some specific instance to illustrate the point?—A. Well, only a question in which I think there was a great deal of trouble—in connection with the fitting of the rivets, the rivet holes, in the first eight leaves. I happened to be in the country and was asked to go out there and examine the leaves with Mr. Hammer and others, and they were not as good as they should be; and Mr. Hammer was puzzled as to what he had better do. He had shipped



66 of those girders which he thought would pass. I never saw those. The girders which were in the yard we examined together, and it was rather hard to arrive at a conclusion. They certainly were not as good as they should have been, and Mr. Hammer was much worried; but I think I would have felt just about the same as he did about those particular girders. I can not say but what I had approval of what he had done in that matter at that time. I do not see that he could have done any other way.

The letters from which quotations have been made above are found in Mr. Crane's testimony as Exhibits Nos. 7, 8, and 9 of that testimony.

It does also appear from these letters, however, that a large number of angles were condemned for unfair holes which, after being inspected by a trial with the plates, were passed and accepted. This would seem to indicate that the holes as originally punched were better than the inspectors thought they were from measuring them up without trying the actual plates on them, and substantiates the contention that unusual and unnecessary accuracy was being demanded in the spacing of the holes.

The work went together all right in the field, but it is not certain as to what difficulty might have been experienced if these rejections had not been made. Whether or not the work should have been subjected to such close inspection in the shop as to measuring up of the holes, or accuracy in spacing, or whether this should have been left for the contractor to correct in the field, is a disputable question, but in view of the fact that half the value of the completed work was being paid for prior to erection, it is believed that the detail inspection was justified.

The material rejected under the conditions stated should not, in the opinion of your committee, be paid for.

May 1, 1911. Contract 4845, girder G 14 R, serial 11; rejected—	Pounds.
Center web .....	3, 570
Downstream chord angles.....	2, 170
	<hr/> 5, 740

The principal objection to the center web was that the holes were out one-eighth inch. This was in excess of the allowance that had been fixed by Mr. Hammer, under the direction of Mr. Goldmark, in his letter of April 17, 1911, Exhibits 11 and 12 in the testimony of Mr. Wolfel, of November 7. This was an unreasonably close limitation as to the amount the jig holes should be out before the material was rejected. (See testimony of Mr. Monniche, vol. 37, pp. 13, 14, and 15, and the statements of Mr. Wolfel in connection with that testimony on these pages.)

Downstream chord angles: The only objection to these angles was that the holes were out one-eighth inch. This was unreasonably close, and the material should not have been rejected on this account, and should be paid for.

May 15, 1911. Contract 4845, rejections owing to unsatisfactory holes:	Pounds.
Girder G 14 R, serial 14—	
2 upstream chord angles, holes out of center.....	4, 385
1 miter end plate, oblong holes for A frames.....	714
2 quoin end plates, oblong holes for A frames.....	1, 428
Girder G 14 R, serial 17—	
2 downstream chord angles, holes out of center.....	2, 170
	<hr/> 8, 697

In a letter dated May 15, 1911, to Mr. Hammer, Mr. Price states:

Referring to girder G 14 R, serial 14, shop order 4845, the following parts are rejected account of a number of oblong holes in frame A connections, and a number of holes not properly spaced in the chord angles: Upstream chord angles, 2; end reinforcing plate at miter end, 1; end reinforcing plates at quoin end, 2.

Referring to girder G 14 R, serial 17, shop order 4845: Downstream chord angles are rejected, owing to a number of holes not being properly spaced.

In view of all the testimony in connection with the accuracy demanded in the spacing of the holes, and in the absence of any specific statement from Mr. Price as to the number of oblong holes there were in the frame connections and as to how the holes were spaced in the chord angles and reinforcing plates at the miter and quoin ends of the girder, it is believed that this rejection does not appear to be supported by the evidence, and the amount of material, therefore, should be paid for.

Jan. 16, 1913. Contract 4873, rejection of all 8 by 8 by 3/4 inch angles on Jones & Laughlin heat, No. 14678-----pounds-- 5, 220

On pages 220 and 221 of this report, especially page 221, there is quite a number of chord angles shown that were broken during some process of manufacture. It is understood that these chord angles came from this heat, and the rejection of these chord angles was made for the reason that it was not considered that the material from this heat was satisfactory for the lock gates. This rejection was properly made.

Material listed by Mr. Price in Exhibit No. 8, volume 18 of the testimony, considered in detail above. Action recommended as follows:

Rejected at the pickling plant, replaced without charge-----number-- 917, 880

Rejected after complete or partial fabrication of the members, as follows:

	Rejection approved.	To be paid for.
	<i>Pounds.</i>	<i>Pounds.</i>
Rejected for rust pitting (see pp. 217, 218, and 219 of this report).....	39, 592	100, 240
Admitted to have been properly rejected for various causes stated on pp. 222 and 221 of this report.....	94, 893	.....
Material rejected for various causes stated on pp. 223 and 224, defects not considered injurious.....		48, 181
Material rejected for oblong holes (see pp. 224 and 225 of this report).....		7, 760
Rejections for surface defects (see pp. 225, 226, 227, 228, and 229 of this report)....	26, 538	4, 500
Rejections for piping (see pp. 229, 230, and 231 of this report).....	28, 366	.....
Rejections account of slivers on edges of plates (see p. 232 of this report).....	6, 400	.....
Rejections for miscellaneous reasons (see pp. 232 to 236, inclusive, of this report)..<	47, 665	1, 856
Rejections account errors in punching and spacing of holes (see pp. 237 to 244, inclusive, of this report).....	26, 680	14, 677
Total.....	270, 134	177, 214

One hundred and seventy-seven thousand two hundred and fourteen pounds of the material that was contained in the list of rejected material prepared by Mr. Price, and referred to above, should be paid for at a price to be determined later.

In addition to the material above specified, it appears that 55,884 pounds of material was scrapped in connection with the making of the bounding angles. (See testimony of Mr. Pendergrass, vol. 15, pp. 121 and 122). Mr. Pendergrass states:

I have found that in the case of these angles there was at least 55,884 pounds scrapped on account of trying to make them the way they were shown on the



design. I say, "at least," because I find that there was material ordered for the first contracts and cut up into lengths which would work out for the angles made in four pieces, and that they were not actually bent, or anything done on them, when it was decided that it was impracticable to make them that way; and those angles were transferred to other places on later contracts and were cut up; so that there would be some waste in connection with the use of those angles in other places; but just how much is a question.

The original cost of the material for the angles was \$1.40 per hundred weight. The scrap value of the material was \$13.53 a ton. (See statement of charges made against the contract on account of scrapped material, Exhibit 27, vol. 27, of the evidence.)

In view of the fact that expensive experiments were made with these bounding angles of the water-tight frames, and that they were made on material that was scrapped, it is recommended that the same allowance be made for the value of this material, per ton, as will be subsequently fixed as an allowance for other material under the first item of claim 3.

An allowance has been made under claim C-7, appendix, pages 30 and 31 of the original claim, pages 209 and 210 of this report, for 17 tons of material removed on account of countersinking the rivets. This added to the allowance recommended here would make 267,098 pounds of material rejected and thrown into scrap that is to be paid for.

In Mr. Pendergrass's statement of the effect of changes made by the agreement of August 8, 1910, and of other changes made in the work by subsequent agreements, he shows under B-4, page 10 of the appendix to the original claim, pages 2 and 3, Exhibit 27, that the change in the design of the wedges specified therein caused the scrapping of 253,250 pounds of material that should not have been scrapped under the original design. It is also shown that in addition to this the changes in the wedges required thin fillers to be provided under the wedges and that the contractor was required to ship 119,084 pounds and was only paid for 73,300 pounds. This would account for another 45,784 pounds of scrap.

On page 3 of this statement, B-7, Mr. Pendergrass shows that 14,540 pounds of material was lost in the adjustment of fillers between the end reaction castings.

Thirty tons of material was scrapped on account of the vent holes in the girders being enlarged. (See claim C-4, appendix to the original claim, p. 27, and statement of Pendergrass of Apr. 30, p. 8, Exhibit 27.)

In addition to the above amount of material accounted for as scrap, it appears from the testimony of Mr. Barnes, volume 16, page 135, that 31,000 pounds of turned bolts sent to Pittsburgh were rejected and returned to the Rankin shops. This would account for a total of 940,922 pounds.

Your committee recommends that an allowance for the value of 300,000 pounds of scrap be made on item 1 of claim 2. This allowance would include 177,214 pounds on specific items above considered, 55,844 pounds of material rejected in experimenting with the bounding angles, and about 10 per cent to cover unidentified items of material that must have been scrapped due to the great accuracy that was being demanded in the work, as heretofore shown.

As heretofore shown, the general expenses and departmental shop labor cost of fabricating this material was \$17.89 per ton, approxi-

mately. The cost of the material purchased from Jones & Laughlin was \$1.40 per hundredweight, or \$28 per ton. These two sums added together would make \$45.89 per ton. From this should be taken the scrap value of the material, which is between \$11 and \$12 per ton. The price to be paid for this material will, therefore, be fixed at \$35 per ton, making an allowance of \$5,250 on the first item of claim 3.

The second item of claim 3 is for the weight of the excess rivets cut out. As nearly as your committee can arrive at the total number of rivets cut out, there were between 1,000,000 and 1,200,000. The weight of the excess rivets for which the Commission should be held responsible, and for which an allowance is recommended, is 300,000 pounds. (For details see p. 475 of this report.) This at \$35 a ton, the value heretofore fixed, would equal \$5,250 to be allowed for the material and labor in excess rivets cut out, for which the Commission should be held responsible.

As heretofore shown, the claim for the bolt material put in stock on account of excessive demands of the Commission's inspectors has not been substantiated.

The total amount that it is recommended be allowed on claim 3 is \$10,500.

Claim 4, page 67:

Extra cost of water stops soaked in red lead and linseed oil, put in place, \$21,999.75.

The water stops were necessary. They were not provided for under the original specifications. It was essential and necessary to secure water-tightness to use them, and it cost the Contractor a considerable sum of money to provide them. (See testimony of Mr. Guynn, vol. 32, p. 41; also vol. 6, pp. 61 and 62; see also testimony of Mr. Wolfel, vol. 7, pp. 160 to 165, and testimony of Mr. Pendergrass, vol. 15, pp. 43 to 45; also testimony of Mr. Goldmark, vol. 7, pp. 161 and 162.)

The water stops were paid for under the provisions of item 1, which reads as follows:

NOTE.—The above item is to cover all material not specifically listed in other items.

It was undoubtedly unfair to require the contractor to provide water stops and to pay him only the price of item 1 for the material. The claim as finally stated is shown in Exhibit 83 of Mr. Wolfel's testimony, volume 7, as follows:

WASHINGTON, D. C., May 12, 1915.

I further find that there was returned to the States two rolls of canvas or duck, one roll containing 105 yards and the other roll 20 yards, or a total of 125 yards. One hundred and twenty-five yards at 61 cents per running yard equals \$76.25. To this should be added the value of the canvas or duck used on the Isthmus to make tarpaulins, \$180.56, or a total of \$256.81.

There should therefore be deducted from our claim of \$22,232, given on page 69, an amount equal to  $\$22,232 \times 257 \div 7,564 = \$755$ .

This makes the total amount of our claim, finally,  $\$22,232 - \$755$ , or \$21,477.

PAUL L. WOLFEL.

(See also p. 70 of the claim.)

This claim was further reduced to \$21,094.75 by the Contractor when his claim was reduced to correspond with his books. (See p. 67 of the claim; see also Exhibit 85 of Wolfel's testimony, vol. 7.)



The use of water stops constituted a change in the specifications. For this change the Contractor would be entitled to reasonable compensation. It is considered that the claim for \$21,094.75 is reasonable, and that the amount was equitably and justly due the Contractor on account of this change in the specifications.

The amount of the claim should be allowed.

Claim 5, page 67. This claim is as follows:

Loss on shop output, due to delays, unfair demands of the Commission's engineers, and unreasonable inspection, \$123,660.

On pages 70 and 71 of the original claim, the Contractor states the way this amount is arrived at as follows:

On page 72 we give table showing output of shop No. 2, the shop in which the lock gates were fabricated, for the year preceding and the year succeeding the period of 26 months, during which time the lock gates were manufactured. From this table it will be noted that the average monthly output of the shop for the year preceding and the year succeeding the manufacture of these gates was 3,451 tons, while the average monthly output of the shop for the 26 months during the fabrication of these gates was 2,562 tons, a loss of 889 tons per month. The total loss in output of the shop for the 26 months was 26 times 889 tons, equals 23,114 tons.

By an inspection of the table it will be seen that the output of the shop began to drop immediately after the manufacture of these gates was started in November, 1910, dropping from 3,724 tons in November, 1910, to 2,631 tons in December, 1910, and still further to 2,098 tons in January, 1911, 1,132 tons in February, 1911, and 1,290 tons in March, 1911. This loss in output was entirely due to the unreasonable inspection and conditions imposed upon the Contractor by the Commission's engineers and inspectors.

The average profit made on the entire tonnage turned out by the Contractor for the year preceding the lock-gate work, and for the year succeeding the lock-gate fabrication was approximately \$5.35 per ton. Consequently, the resultant loss on the reduced output due to the unfair demands of the Commission's engineers, and the unreasonable inspection, was 23,114 tons at \$5.35 per ton, or \$123,660.

The loss of output with which the Isthmian Canal Commission should be charged is 4,702 tons. (See p. 215 of this report.)

In claims for damages for breach of a contract, loss due to anticipated profits is not usually considered as a proper element of damages, for the reason that such was not within the contemplation of the parties at the time of the making of the contract. (See case of *Howard v. Stillwell & Bierce Manufacturing Co.*, 139 U. S., 199; case of *Globe Refining Co. v. Landa Cotton Oil Co.*, 190 U. S., 540; *Cincinnati Gas Co. v. Western Siemens Co.*, 152 U. S., 200.) The courts do hold, however, that the loss of future profits due to the interruption of a going business by trespass is a proper element in awarding compensatory damages. (See case of *Weinman v. De Palama*, 232 U. S., 571.) The court states in this case (p. 575):

In our opinion, the court correctly held that where a trespass results in the destruction of a building, with consequent interruption of a going business, the loss of future profits (these being reasonably certain and proved with reasonable exactitude) forms a proper element for consideration in awarding compensatory damages.

The claim now under consideration is an equitable claim, and the Contractor should be compensated for losses caused to him in the fabrication of the lock-gate material "under requirements as to character and finish not fairly within the specifications."

Under this view it seems to your committee that the claim for loss of profits on an anticipated output, which was reasonably certain,

should be allowed. The amount of such profits, as nearly as can be determined with any reasonable exactitude, is about \$5 per ton. An allowance of \$5 per ton on 4,702 tons is recommended on this claim.

As heretofore shown, further compensation in connection with this delay, or rather further damages in connection with this delay of 50 days, will be taken into consideration in adjusting the claim for rush work under claim 6. (See p. 215 of this report.)

In connection with the recommendations as to the amounts to be allowed on the above claims, your committee submits the following statement:

(1) The total amount allowed is equivalent to an increase in the contract price for fabricating the structural steel parts of the lock-gate material of about \$2.56 per ton.

(2) There were probably about 600 days consumed in the manufacture of the lock-gate material. If the allowance above recommended should be spread out over the 600 days, it would amount to an allowance in excess of the payments heretofore made of about \$230 per day.

(3) Where it has been necessary to establish normal costs from estimates, the statements of the committee in connection with such normal costs must be considered as estimates made from all of the testimony as representing the best judgment of the committee as to what the normal costs should have been from all the testimony. This is especially true as to the details of shop operations. (Pp. 202, 203, 204, and 205 of this report.)

(4) Your committee endeavored to give in as much detail as practicable in this report the various elements upon which each conclusion rests, and has drawn from these details such conclusions as it deemed justified from all of the evidence.

(5) It may seem, in some cases, that sufficient weight has not been given to the testimony of such experts as Mr. Goldmark and Mr. Wolfel as to the character of the material to be fabricated and the probable normal shop costs, and to the estimates of Mr. Pittman. But in view of the fact that there seems to have been, all the way through the shop operations in connection with this lock-gate material, underestimating on the part of the Contractor, and probably underestimating on the part of Mr. Goldmark as to the real character of this work, and underestimating as to the effect that the great number of duplicate pieces would have on the shop cost, it is believed that the estimate made by your committee is fair, reasonable, and just.

It is desired to state at this point also that there were a very large number of small pieces, some of which were quite difficult to manufacture, and that it was necessary to manufacture a great number of small pieces accurately.

(6) Your committee also desires to point out that under this contract it was necessary to so fabricate the material as to install a pumping system, which is not a usual thing in bridge work.

(7) It was also necessary to so fabricate the material that access could be had to various compartments of the lock gates by means of manholes, which had to be made water-tight, running through the entire work.

(8) It is also to be noted in this work that such parts of it as resembled ship work were to be fabricated in the yard, transported a distance and there erected, which is not a usual practice in connec-



tion with ship work, and this fact alone would demand probably closer inspection and greater accuracy in the work than if it was to be fabricated and erected in the yard, where corrections in material erroneously manufactured could be remedied.

(9) The fact that considerable saving was made by the Commission in weight by changes made under the agreement of August 8, 1910, might justify a larger allowance, if it were not for the fact that this saving was consented to by the Contractor, primarily, in consideration of having the end planing waived. The extent to which they were denied this consideration in connection with the waiving of the end planing will be taken care of in the allowance to be made under claim 6.

(10) Owing to the numerous changes that were made in the specifications after the original bid was made on the original specifications, it has been very hard to make any comparison between the estimated price of fabricating the work under the original specifications and a proper normal under such specifications. If the work had been let to the next highest bidder, and like changes had been made in the specifications, it would have proportionately increased the shopwork to such next highest bidder, but in all probability his estimate for the shopcost of fabricating the material, with such additions as were made under the agreement of August 8, 1910, would have been higher than the final estimate that has been made by the Commission as to the proper normal shopcost. It has been necessary to take these things into consideration in order that, in the final allowance, the contractor should not receive compensation for doing extra work in the shop which, under the terms of the original contract, would have had to have been done in the field. In other words, it would neither be just, equitable, nor fair to relieve the Contractor of field work under his bid and pay him increased compensation for doing that work in the shop.

The allowances recommended on claims in connection with shopwork in the United States are as follows:

	Amount.	Page No. of report.
Claim No. 1, drawings.....	\$5,580.00	15
Claim No. 2, increased shop cost, changes, etc.....	77,261.64	211
Claim No. 3, rejected material.....	10,500.00	246, 247
Claim No. 4, increase for water stop.....	21,091.75	248
Claim No. 5, loss of output, shop 2.....	23,510.00	240
Total.....	137,949.39	

This is about \$2.56 per ton on the tonnage fabricated in shop No. 2.

#### APPENDIX O-1.

[W. O 28323, delay on account of rejected material.]

PITTSBURGH, PA., September 10, 1912.

Maj. F. C. BOGGS,

*Corps of Engineers, United States Army,*

*General Purchasing Officer, Interstate Commerce Commission,*

*Washington, D. C.*

DEAR SIR: It appears that we will not be able to make final shipment of the rising stem valves covered by item 4, class 2, circular 636, our contract 5467,

and the lateral culvert valves, covered by item 6, class 2, circular 636, our contract 5471, before early in December, owing to recent rejections of nickel-steel buckle plates and 20-inch beams. The material was rejected by Mr. Candler on account of surface defects in the steel revealed by pickling and sand blasting. The next rolling by Carnegie Steel Co. of nickel-steel plates is scheduled for about October 24, and of nickel-steel beams for about November 15. We have sent inquiries to all of the other mills making nickel steel, and we are unable to procure any better deliveries.

Under the circumstances we trust you will grant us an extension of the contract time on such of the valves as are affected by these rejections. At the present time 16 nickel-steel buckle plates and 13 nickel-steel beams, for which we will enter replace orders at once, stand rejected. This will delay until some time in December the shipment of 9 rising stem valves and 1 lateral culvert valve.

This does not take into account some beams previously rejected which have already been rerolled on replace orders, but which have not yet been delivered to us, and which, of course, have not been pickled or sand blasted. If any of these beams are rejected after pickling, it will increase the number of valves on which an extension of time will be necessary.

Yours, truly,

McCLINTIC-MARSHALL CONSTRUCTION CO.  
E. W. PITTMAN, *Manager Pittsburgh Plant.*

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[W. O. 28323-5467-5471, rejected material.]

BRADDOCK, PA., *September 11, 1912.*

Maj. F. C. Boggs, United States Army,  
*General Purchasing Officer, Interstate Commerce Commission,*  
*Washington, D. C.*

SIR: I would refer to letter of McClintic-Marshall Construction Co., dated September 10, to your office relative to delay in final shipment of the rising stem and lateral culvert valves, which is claimed will be due to the rejection of material entering into the construction of these valves.

It would seem that practically any delay could have been avoided in the fabrication of these valves due to rejected material. Material when rejected was not always promptly reordered. For example, on July 15, 17, and 20 there was a total of fifteen 20-inch nickel I-beams rejected owing to surface defects developed through pickling. Replace mill orders covering these beams were not issued until August 12.

As a rule, material from the mills applying to this work has been stored in the yard for weeks before being pickled, consequently the final inspection for surface examination before fitting-up was delayed. Had material been pickled as soon as received, replace orders could have been immediately issued, and any suspension in the construction of these valves due to lack of material might have been avoided. In addition to material rejected just after pickling, there were a number of beams and plates rejected after being fabricated to the point of assembling, the rejections being due in nearly all cases to the pitted condition of the steel caused by exposure to the weather.

The above information is respectfully tendered that you may be advised concerning circumstances pertaining to rejection of material entering into the request of the McClintic-Marshall Co. for an extension of the contract time.

Very respectfully,

A. V. B. CANDLER,  
*Inspector, Interstate Commerce Commission.*

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[N. O. 28323—Supplementary progress report.]

BRADDOCK, PA., *October 19, 1912.*

Mr. T. M. Post,  
*Assistant Engineer, Isthmian Canal Commission, Washington, D. C.*

SIR: Very little work was performed on rising-stem valves in shops at Rankin during the past week, the completion of the last three valves being delayed awaiting the arrival of eight buckled plates. These plates have been forwarded from the Homestead mills to Ambridge for buckling, and with their



probable receipt at the Rankin plant in the next few days, the finishing of valves by the McClintic-Marshall Construction Co. should be completed some time next week.

Four valves were machined at the Westinghouse Machine Co.'s plant during the past week, but, owing to shortage of cars and the shipment of Westinghouse material being given preference, these valves will not go forward from East Pittsburgh until next week.

Very respectfully,

A. A. BARENTHER,  
*Inspector Isthmian Canal Commission.*

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#### APPENDIX A.

[McClintic-Marshall Construction Co. Works, Pittsburgh, Pottstown, and Carnegie, Pa.]

RANKIN, PA., April 27, 1915.

#### EXPLANATION OF CLAIM FOR INCREASED COST OF DRAWING-ROOM WORK ON ACCOUNT OF DELAYS, INCOMPLETE INFORMATION, AND CHANGES.

The contract for the lock gates was signed June 21, 1910, and the work was immediately started in the drafting room. It was soon found that the designs were incomplete, and that considerable study would have to be made and general features worked out before the preparation of the shop drawings could be actually started. We started two of our ablest men on this and these two were assisted by others as soon as it was possible to use additional men. As pointed out on page 19 of appendix to claim, practically no work could be done until after the agreement of August 8 with Mr. Goldmark had been signed. We have looked up our records and find that up to the 1st of August there had been charged against the drawing for this work slightly over \$600. We believe therefore that it is safe to assume that up to the 8th of August there had been at least \$700 spent on this preliminary work, the greater part of which would have been avoided if the designs had been complete. The two principal features of design as it now occurs to us on which we spent the greatest amount of time were the construction of the ends, and the various details for insuring water-tightness, most of which had been entirely overlooked in preparing the designs.

The drafting-room work was also delayed on account of the hold up in the water-tight frames, due to the likelihood of changing manhole covers and rings. As brought out in the claim, pages 3 to 6, inclusive, of appendix, we were prevented from ordering the water-tight frames until December 17, and were not given the final information for making the details until December 24, six months after the beginning of the drafting-room work.

In working up the shop drawings, we would naturally start at the bottom of the gate, the part which is wanted first. Soon after we started, the question of the pump chamber in the bottom panel was discussed with Mr. Hammer, and it appeared that the pumping-system scheme would be changed. We were therefore held up on the drafting-room part of this work. Later on we were instructed to go ahead on the basis of the original design, and still later were advised that the system would be changed, and when information was finally received, we were compelled to make over several drawings, all as outlined on page 24 of appendix.

We were also delayed in completing the work at the top of gates on account of missing information for mitering mechanism and strut connection.

The only way to proceed economically with the making of shop drawings is to have the complete information at hand before the work is started. If work is started before complete information is at hand, the draftsmen constantly meet with details which can not be settled finally until further information is received and are compelled to leave the drawings for this particular part of the work in an incomplete condition and take it up later or else drop this part of the work altogether. This has the effect of retarding the work, because the impression soon is made that as the work can not be completed there is no use in using up much energy in partially completing the details. It is therefore a very difficult matter to estimate, even approximately, the increase in cost of the drawings due to the delays as has just been outlined. We have already called



attention to the fact that there was approximately \$700 spent before August 8, the greater part of which was caused by incomplete information. In addition to this we believe that the increased cost of drawings, due to the lack of information, would amount to probably 5 per cent of the total cost of the drawings or approximately \$1,000.

After more or less work had been done in the shop drawings, we were compelled to make a number of changes. As instructions for quite a number of these changes were verbal from Mr. Hammer, and as quite a number of these were of not very great importance, we are unable to give a complete list of such changes. The changes which are here mentioned do not include all the changes required and while possibly most of the other changes were of not very great importance, yet the total cost of the same would amount to considerable. The changes which we will call attention to in detail are as follows:

(1) Change in pump chamber as outlined on page 24 of Appendix. This change required the making over after having been once completed of drawings 1-B to 5-B, inclusive, and considerable changes on sheets 3-A, 4-A, 5-A, 6 to 18, inclusive, 22, 47, 98, and 99. This change therefore required making over 5 sheets which we have estimated to cost \$45 each, and the revising of 20 sheets the cost of which we have estimated to be \$400, or a total of \$625.

(2) Change in gauges as outlined on page 34 of Appendix. This required changes in the following drawings: 3-A, 3-B, 4-A, 5-A, 4-B, 5-B, 5 to 18, inclusive, 47 to 64, inclusive, 73 to 78 inclusive, 81, 82, 84, 107, 108, 126, 127, and 129, or a total of 51 drawings in all. The cost of revising these drawings we have estimated at \$10 each or a total of \$510.

(3) Change in air vent as outlined on page 27 of Appendix. This required revisions on drawings 3-A, 3-B, 4-A, 4-B, 5-A, 5-B, and 6 to 13, inclusive, or a total of 14 drawings, the cost of revising of which we have estimated to be \$15 per sheet, or a total of \$210.

(4) Change in manhole frames as outlined on page 20 of Appendix. This required revising drawings 115 and 116 and the making of two new drawings, 137 and 138. We have estimated the cost of revising the two drawings to be \$30 and the cost of making two new drawings \$90, or a total of \$120.

(5) Change in mitering mechanism as outlined on page 32 of Appendix. This required the revising of drawings 119, 120, 121, 123, 20-B, 20-C, and 97, a total of seven drawings, the cost of revising of which we have estimated at \$15 each, or a total of \$105.

(6) Adding bent angles at top of air chamber as outlined on page 30 of Appendix. This required revisions on drawings 12 and 13. We estimate the cost of same to be \$30.

(7) Changes in sheathing plates as outlined on page 32 of Appendix. This required the revision of drawings 37 to 45, inclusive, 28, 34, 35, 22, 23, 24, 25, 28, 1-A, 1-B, 47, 48, 49, 50, 51, 52, and 55 to 60, inclusive; also the making over of drawings 36, 26, 27, 29, and 61; also the making of additional drawings 146, 147, 148, 149, 150, and 151. The additional work required for this change is therefore represented by the revision of 31 drawings, making over of 5 drawings, and making 6 new drawings, and the total cost of this we estimate to be \$805.

(8) Mr. Hammer borrowed from us a man to prepare design drawings of manhole covers and frames according to the ideas of himself and Mr. Guynn, as mentioned on page 4 of Appendix. He prepared I. C. C. drawings 201 to 210, inclusive, a total of nine drawings, at an estimated cost of \$20 each, or \$180.

(9) After a drawing had been submitted for approval showing the curb for lower guard gate made of cast iron, as shown on design, Mr. Hammer requested that this be entirely changed, using structural steel instead of cast iron, which required the making of one additional drawing at the estimated cost of \$45. The number of this drawing was 178.

(10) A considerable amount of time was spent by the writer with Mr. Hammer in experimenting on and testing out different styles of gaskets for manhole covers. We believe that the drawing room spent probably \$100 on this work, which does not include that part of the cost of this experimenting which was charged against the shop pay roll.

(11) The work in the drafting room was delayed and the expenses thereof increased on account of the delay in approval of drawings as outlined on pages 34 to 40, inclusive, of Appendix. This delay in the approval, particularly of the latter contracts, necessitated keeping draftsmen on this contract longer than would have been otherwise necessary. This amounted to considerable, as the drawings for the 66-foot gates were not approved for about 11 months after



they had been submitted. The delay in approving these drawings, as well as those for the 82-foot gate, delayed any action upon the working up of spare parts. We pushed Mr. Hammer for the approval of the drawings for these two particular contracts, and, not obtaining very much satisfaction, Mr. McClintic wrote to Mr. Goldmark, as mentioned on page 37 of Appendix. This delay resulted in increased cost in getting out the spare parts on account of the length of time which had elapsed since the drawings for the gates had been made. We believe that while it is questionable how much the cost of these delays in approving the drawings amounted to, yet it would not be unfair to assume that this would probably equal 5 per cent of the total cost of the drawings, or in the neighborhood of \$1,000.

The specifications and contract called for the Contractor to furnish erection diagrams showing the application of the spare parts to the various gates, but did not require them to determine what spare parts would actually be required, except that, in general, these spare parts would consist of a complete 82-foot gate and a few other pieces for a 79-foot gate. We approached Mr. Hammer several times for more definite information as to exactly what spare parts were to be used and finally got from him a general idea of what was wanted. This, however, was verbal and was given only in a very general way and necessitated our taking one of the men who had checked a great deal of this work off from the work on which he was engaged to go into this matter in detail and prepare a list of spare parts which should be used. This matter was gone over with Mr. Hammer and revised, and, after a considerable length of time, we received the final information as to exactly what parts we were to furnish. The expense of all this work, which we believe was not a part of our contract, would amount to probably \$250. In addition to this work on spare parts, Mr. Hammer insisted that we field check over all the pieces furnished as spare parts to make sure that they would match up and build up the gates as required. This required the services of two of the highest-priced men that had been used for this work for a period of several weeks at a cost of at least \$300. This was required of us by Mr. Hammer after we thought we had all of the work required for the spare parts entirely finished.

When the drawings were ready for approval, prints of the same were submitted to Mr. Hammer. However, he took practically no action on such prints unless he had the man in charge of the squad at his elbow to assist him in going over those details and to answer any questions which he might raise. This work was constantly interrupted by Mr. Hammer's time being taken for other work. This same thing was true in securing his approval of tables of quantities and weights and field rivets. It was also Mr. Hammer's practice to call upon this same man whenever questions came up in regard to details as relating to shopwork, material, or shipping weights, so that we believe we are safe in saying that at least one-half of this man's time was spent in Mr. Hammer's office instead of in the drafting room. This not only took up his time, but had an indirect effect in increasing the cost of drawings on account of his absence from the squad of men over which he had charge. The first drawings were submitted for approval September 17, 1910, and the last drawings, not including the spare parts, were finally approved March 18, 1912, approximately 18 months. Assuming that at least one-half of this time was spent in Mr. Hammer's office, it would appear that the cost of the drawings were therefore increased at least \$1,500 and possibly as much as \$2,000.

We give below a summary of these various amounts:

Lost time at the start	\$700
Delays on account of information	1, 000
Change in pump chamber	625
Change in gauges	510
Change in air vent	210
Change in manhole frames	120
Change in mitering mechanism	105
Addition of bent angles, top of air chamber	30
Change in sheathing plates	805
Man loaned to Mr. Hammer	180
Change in cast-iron curbs	45
Experimenting with manhole covers	100
Delay in approving drawings	1, 000
Extra work on spare parts	550
Man in Mr. Hammer's office	1, 500





Total number of holes reamed in shop, 1,730,930. In the field the reaming would have, in general, been through four thicknesses. Therefore the number of holes which would have been reamed in the field according to specifications would have been  $\frac{1,730,930}{4}$  equals 432,730. This at 10 cents per hole would have equaled  $432,730 \times 10$  cents equals \$43,273.00.

Number of holes required in connecting castings to steelwork, which, according to the specifications, should have been drilled in the field, but were punched small in the shop:

Extra cost of shop labor: 480,600 at 25 cents per hundred	\$1, 200
Increase in size of doubling plates: Extra cost of material and shop and erection labor:	
143 tons 109½-inch plates, at \$1	143
143 tons 110¾-inch plates, at \$2	286
87 tons 101-inch plates, at \$1	87
<hr/>	<hr/>
373	516

This added 160 tons of material and 60,700 extra field rivets. As the average number of rivets per ton for the entire work is 110, this should have added only 17,600 rivets to have kept the cost down to the average. We are therefore entitled to pay for:

60,700 minus 17,600 equals 43,100 rivets, at 15 cents per rivet equals \$6,465.

These 43,100 rivets added 14 tons, and as material for rivets averaged \$9 per ton higher than the average cost of material, the extra cost of this is 14 tons at \$10, \$140.

The total extra on this item is therefore \$516.11 plus \$6,465 plus \$140, making a total of \$7,121.

Increase taper of wedge, agreement July 11, 1910, Mr. Goldmark (p. 23).

Loss on account of scrap, extra cost of shop labor and material, which has never been paid for:

Original design showed wedge tapering 1.8 in 11¼ inches, while this was changed to seventeen thirty-seconds inch in 12 inches.

Five thirty-seconds inch original design, nineteen thirty-seconds inch as made.

Material lost in planing:

Original design	pounds	90, 100
Revised design	do	343, 350
		<hr/>
		253, 250
		<hr/>
253,250 pounds, at 0.03785 cent		\$9, 585. 51
Extra cost planing 25,200 linear feet, at 20 cents		5, 040. 00
		<hr/>
		14, 625. 00
Less \$16 per ton scrap and freight		2, 025. 00
		<hr/>
		12, 600. 00

The change in wedges required thin fillers to be provided under wedges. As we were paid for only the theoretical amount of fillers required, and as it was necessary to ship additional fillers, we should be paid for the difference.

We shipped 119,084 pounds and were paid for 73,300 pounds. We are therefore entitled to payment for 45,784 pounds, at 0.03785 cent per pound, amounting to \$1,733.00.

Fillers between splice plates and sheathing plates: Extra cost of material and shop labor:

As the most of this material cost us extra, and as the thin material would cost very much higher per pound in the shop than the thicker material used on the contract, I have estimated the cost of this as follows and have taken the average cost of the shopwork on the entire contract, as follows.

Thickness.	Number.	Weight.	Extra for material.	Shop 100 per 100 pounds.	Shop cost.
One-sixteenth inch.....	3,700	53,420	At \$12 = \$320	\$3.70	\$1,976
One-eighth inch.....	1,554	29,716	At \$5 = 75	1.85	550
Three-sixteenths inch.....	2,076	107,328	At \$2 = 107	1.23	1,320
One-fourth inch.....	5,120	289,792	....	.92	2,666
		480,256	502		6,512

Total.....	\$6,512
Average cost of shop work, 90 cents per 100 pounds.....	4,322

1 2,290  
2 502

	2,792
Cost of chamfering edges of sheathing plates, 2,472 plates, at \$1.60 .....	3,955

<sup>1</sup> Shop.

: Material.

Adjustment fillers between end reaction castings, extra cost of material and shop labor: Ordered weight, 24,230 pounds; shipped weight, 9,690 pounds.

Material -----	\$3. 80	Contract costs:	
Fabrication -----	5. 00	Material -----	\$1. 45
Drawings -----	. 05	Fabrication -----	. 90
Paint -----	. 05	Drawings -----	. 01
Freight -----	. 30	Paint -----	. 04
	<hr/>	Freight -----	. 30
	<sup>1</sup> 9. 20		<hr/>
			2. 70

\$9.20 minus \$2.70 equals \$6.50.

9,690 pounds, at 6½ cents-----\$630. 00

Adjustment fillers except for end reaction castings:

*Extra cost of material.*

Thickness.	Weight (pounds).	Per ton.	Cost.
One-sixteenth inch.....	8,852	\$12.00	\$54.00
One-eighth inch.....	11,128	5.00	27.00
Three-sixteenths inch.....	14,208	2.00	14.00
One-fourth inch.....	22,228	-----	-----
			95.00

Thickness.	Weight (pounds).	Per 100 pounds.	Cost.
One-sixteenth inch.....	8,852	\$3. 70	\$327. 00
One-eighth inch.....	11,128	1. 85 (1. 85)	206. 00
Three-sixteenths inch.....	14,208	1. 23	175. 00
One-fourth inch.....	22,228	. 92	205. 00
56,416 pounds at 90 cents average shop cost.....			913. 00
			508. 00
			405. 00
			95. 00
			500. 00

Changing one line 1½" bolts to 1⅛" rivets in each wing of end reaction castings,  
Agreement July 11, 1910. Mr. Goldmark. P-33.

<sup>1</sup> Per hundredweight.



Extra cost of material and erection labor: 73,500 rivets—15 cents cost of driving in excess of cost of placing bolts, \$11,025.

73,500 equals 70 tons, at \$10 per ton----- \$700. 00

11, 725. 00

Price of turned bolts, \$0.073.

Price of rivets, \$0.03785.

Cost of bolts, original design—688,000, at \$0.073----- \$50, 224. 00

Cost of bolts and rivets as built—370,500, at \$0.073----- 27, 046. 00

146,000, at \$0.03785----- 5, 627. 00

Saving to commission----- 17, 651. 00

Use of 1-inch rivets in upstream material over eleven-sixteenths inch thick with 8 x 8 inch angles.

Extra cost of material and shop labor:  $3\frac{3}{4}$ -inch average pitch of 1-inch rivets;  $3\frac{1}{4}$ -inch average pitch of seven-eighths inch rivets.

1,427,000 1-inch rivets replace 1,646,500 seven-eighths inch rivets.

1,427,000, at 14.7 cents----- \$209, 769. 00

1,646,500, at 10.7 cents----- 176, 175. 00

Extra cost of driving----- 33, 594. 00

Average grip of rivets,  $2\frac{1}{2}$  inches.

1,427,000 x 1.34----- 1, 912, 180 pounds.

1,646,500 x .929----- 1, 529, 600

382, 580 at \$10 per ton-- 1, 913. 00

35, 507. 00

Omitting splices in cover plates and sheathing, saving to commission and extra cost of shop labor, crating material, and drawings:

Reducing cover plates from  $13\frac{1}{4}$  to  $12\frac{3}{8}$  inch----- Pounds. 110, 000

Downstream cover-plate splices----- 74, 800

Upstream cover-plate splices----- 456, 200

Downstream sheathing-plate splices----- 304, 600

945, 600

Saving to commission 945,600 pounds. at \$0.03785, \$35,793.

In obtaining the extra cost to us of this we have estimated as follows:

12 drawings, at \$35 per drawing----- \$480. 00

50 tons of material, at \$40 per ton----- 2, 000. 00

Shop labor and extra insurance and wood required in boxing:

1,961 tons, at \$3 per ton----- 5, 883. 00

Added to girders 687 tons, at \$1----- 687. 00

9, 050. 00

Mill stiffeners to obtain bearing to keep girder to uniform depth. Agreement July 11, Mr. Goldmark, p. 20.

Extra cost of shop labor:

18 pairs stiffeners per girder.

1, 540 girders.

38 spare parts.

1, 578

279

1, 300 girders, at \$4----- \$5, 200. 00

Splitting diaphragm "B" as per agreement July 11, 1910, with Mr. Goldmark.

Extra cost labor, extra field rivets through chord angles:

23,400, at 15 cents----- \$3, 510. 00

Omitting of clipped corners; saved in shopwork and material; number of clips omitted, 26,782.

Average weight of material which would have been scrapped by each clip,  $2\frac{1}{2}$  pounds.

26,782 × 2½ equals 66,955 pounds, at \$1.40	\$937. 00
Clipping and chipping cuts: 26,782, at 5 cents	1, 339. 00

Total saving	2, 276. 00
--------------	------------

Changing tapered fillers: Saving to McC. M. Co., in shop work and material: 1,692 bevel fillers 5 inches wide by 5 feet 10 inches long, beveled from three-fourths to seven-sixteenths inch, required by original design.

Material which would have been scrapped:

26,320 pounds, at \$1.40 per cwt	\$368. 00
9,870 lin. ft. of planing, at 20 cents	1, 974. 00

Total saving	2, 342. 00
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Additional holes punched, 44,000, at 20 cents per 100	88. 00
---	--------

Additional fitting, 1,692 pieces, at .05 cents	85. 00
--	--------

173. 00
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Net saving	2, 179. 00
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Using fillers under stiffeners: Saving in shop labor:

Number of crimps omitted, 28,080, at 3½ cents each	\$983. 00
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Number of holes punched instead of drilled:

Saving to McC. M. Co., 3,204,000, at 30 cents per hundred	\$9, 612. 00
---	--------------

Material scrapped on account of enlarged vent holes in girders: Loss to us on account of material scrapped:

30 tons, for which, after allowing the scrap value of this material we are entitled to \$59.00 per ton, or	\$1, 770. 00
--	--------------

Cost of water stops: Extra cost of material and shop and erection labor:

Required 223,200 sq. ft. of canvas weighing 22,940 pounds	\$7, 564. 00
---	--------------

We assumed that one gallon of red lead and linseed oil would saturate 60 sq. ft. This would require 3,720 gallons, at \$1.50 per gallon	5, 580. 00
---	------------

Assuming that the cost of applying this paint and oil and putting the water stops in position with cost .04 cent per square foot, the cost of this amounts to	8, 928. 00
---	------------

Total cost of canvas, paint, and placing	22, 072. 00
--	-------------

Received at contract price	222. 25
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21, 849. 75
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Adding bent angles at ends of girders, top of air chambers: Extra cost of shop labor:

188, at \$8.00	\$1, 504. 00
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(Hammer's request in approving sheets Nos. 12 and 13.)

Countersunk rivets: Extra cost of shop and erection labor and loss on account of material scrapped:

Shop, 440,000, at three-fourths cent each	\$3, 300. 00
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Field, 308,000, at 5 cents each	15, 400. 00
---------------------------------	-------------

Total	18, 700. 00
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In countersinking, this removed 17 tons of metal, for which we would have obtained payment under the original design and for which, allowing for scrap, we are entitled to \$59.00 per ton or, \$1,003.00, which gives a grand total to which we are entitled of \$19,703.00.

Angles in water-tight frames made in one piece instead of four: Extra cost of shop labor:

2, 544
96

2. 640, at \$3.00	\$7, 920. 00
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Summary.

	Extra cost to McC. M.	Saving to McC. M.		Extra cost to McC. M.	Saving to McC. M.
B-1.....	\$76,873.00	\$43,273.00	B-13.....		\$2,276.00
B-2.....	1,200.00		B-14.....		2,179.00
B-3.....	7,121.00		B-15.....		983.00
B-4.....	14,333.00		B-17.....		9,612.00
B-5, B-6.....	6,747.00		C-4.....	\$1,770.00	
B-7.....	1,130.00		C-6.....	1,504.00	
B-8.....	11,725.00		C-7.....	19,703.00	
B-9.....	35,507.00		C-8.....	7,920.00	
B-10.....	9,050.00				
B-11.....	5,200.00			203,293.00	58,323.00
B-12.....	3,510.00				

NOTE.—C-5 is not included in this summary, as it is a separate claim.

(Signed) R. A. PENDERGRASS.

*Analysis of extra shop labor and expenses added by the Goldmark agreement of August 8, 1910, and subsequent changes authorized by Mr. Hammer and considered in the appendix of the claim.*

This analysis is made from the data furnished by Mr. Pendergrass of April 30, 1915, Exhibit 27, and the analysis of this charge made by Mr. Wolfel and submitted November 4, 1915, and found in the file—"Miscellaneous data taken from the records and furnished by the Contractor."

B-1. Wolfel and I agree.....	\$74,766.00
B-2. Wolfel and I agree.....	1,200.00
B-3. Wolfel classes all this as material. There should be a charge for 60,700 field holes added and the cost of making 60,700 rivets of not less than \$3.50 a ton for shop labor on rivets and of 70¢ a ton for punching 6,070 holes in 160 tons of material:	
\$3.50 x 160.....	\$560.00
.70 x 160.....	112.00
	672.00
Total to be added to Wolfel's statement for this item.....	672.00
B-4. Wolfel and I agree.....	5,040.00
B-5 & 6. Wolfel and I agree.....	6,245.00
B-7. The shop labor in this item is hard to separate for fillers between end reaction casting; the shop labor added is \$5.00 per hundred less 90¢ or \$4.10 on 9,690 pounds or \$397.29 as I find it. On other fillers it is \$405.00.....	802.29
B-8. All field and material.	
B-9. No charge by Wolfel. The increase of \$10.00 a ton to cover cost of making rivets is a shop labor charge and should be added.....	1,913.00
B-10. Wolfel charge for labor is \$4,000.00. My charge is \$7,050.00. My charge included all but \$2,000.00 for material. The drawing, \$480.00, should not have been included because it is a separate item. The extra insurance and wood which Mr. Wolfel takes out is \$1,883.00, which may be large, but as there is no way to verify it, we will accept it. The charge of \$1.00 per ton for 687 tons added to girder is not credited by Wolfel. Corrected amount, labor charge.....	4,000.00
B-11. Wolfel and I agree.....	5,200.00
B-14. Wolfel has no charge for added labor, but deducts \$173 from \$1,974—leaving \$1,801 saved. Should be \$173 added under my form of statement.....	173.00
Total added, Goldmark agreement.....	100,011.29

Shop labor expense saved, Goldmark agreement.

B-13. Wolfel and I agree-----	\$1, 339. 00
B-14. I credit whole saving because have charged the increase--	1, 974. 00
B-15. Wolfel and I agree-----	983. 00
B-17. Wolfel and I agree-----	9, 612. 00
B-19. Not included by Pendergrass and not in my statement----	7, 400. 00
Total saved-----	21, 308. 00
Added labor, Goldmark agreement-----	\$100, 011. 29
Saved-----	21, 308. 00
	78, 703. 29
Added for changes:	
C-6. Not included in my statement-----	1, 504. 00
C-7. Wolfel and I agree-----	3, 300. 00
C-8. Wolfel gives \$13,832. I have \$13,872. Correct amount----	13, 832. 00
Total-----	18, 636. 00
All labor increase, Goldmark agreement-----	78, 703. 29
Changes subsequently made-----	18, 636. 00
	97, 339. 29

APPENDIX C.

McClintic-Marshall Construction Co.

DEPARTMENTAL SHOP COST CONTRACT RECORD.

[Panama contracts 4845-67, inclusive, and 4873.]

Department.	Cost.	Rate per ton.	Department.	Cost.	Rate per ton.
Making templets.....	\$4,998.31	\$0.09	Sub-Punched reaming.....	\$50,924.44	\$0.94
Making patterns.....	52.20		Bulldozer.....	6,390.89	.12
Unloading.....	6,878.57	.13	Machine riveting.....	32,963.36	.62
Plate straightening.....	3,396.10	.06	Hand riveting.....	1,574.78	.03
Running in.....	5,507.14	.10	Sand blast.....	13,002.32	.24
Weldg. and Dplx. Mlg.....	3,184.75	.06	Rotary planing.....	14,584.23	.27
Shearing.....	13,436.54	.25	Boring.....	465.09	.01
Laying off.....	22,706.45	.42	Calking and riveting ladders ..	1,798.22	.03
Trucking in L. O. and P. Depts.....	7,887.97	.15	Grinding.....	872.47	.02
Punching.....	48,884.93	.91	Chipping.....	14,255.32	.26
Punching Cont. Washers.....	143.68		Blacksmith shop.....	41,477.69	.77
Drilling.....	10,896.46	.20	Machine shop.....	10,799.36	.20
Pickling.....	6,318.75	.12	Running out.....	10,508.63	.19
Edge planing.....	12,283.40	.23	Storing.....	85.01	
Bending and straightening....	3,126.51	.06	Loading and bracing.....	8,520.42	.16
Fitting.....	71,079.02	1.32	Indirect labor.....	19,232.74	.35
Trucking in F. and R. Depts..	8,308.65	.15	Painting.....	11,180.36	.21
Making jigs.....	747.24	.01			
Reaming.....	5,689.54	.11	Total.....	474,161.54	8.79

RECORD FROM FEBRUARY, 1913, TO FEBRUARY, 1914.

Making templets.....	\$10,068.01	\$0.26	Subpunched reaming.....	\$12,317.86	\$0.32
Making patterns.....	17.44		Bulldozer.....	184.85	
Unloading.....	3,826.75	.10	Machine riveting.....	25,827.67	.69
Plate straightening.....	1,084.44	.02	Hand riveting.....	9,899.98	.25
Running in.....	5,238.29	.13	Cut out and redrive rivets....	.98	
Stockyard.....	1,357.09	.03	Rotary planing.....	4,290.52	.10
Shearing.....	8,298.43	.21	Boring.....	259.76	.01
Laying off.....	12,181.87	.31	Caulk and riveting ladders...	8.25	
Trucking in L. O. and P. Depts.....	3,847.54	.10	Pickling.....	20.13	
Punching.....	22,191.71	.57	Chipping.....	3,305.79	.08
Punching cont. washers.....	24.08		Blacksmith shop.....	6,537.64	.17
Drilling.....	6,973.66	.18	Machine shop.....	2,793.94	.07
Milling.....	79.07		Running out.....	4,776.42	.12
Edge planing.....	991.02	.02	Storing.....	118.23	
Bending and straightening...	1,266.93	.03	Loading and bracing.....	5,311.38	.13
Fitting.....	42,694.16	1.10	Indirect labor.....	35,852.39	.93
Trucking in F. and R. Depts.	5,149.61	.12	Painting.....	7,132.62	.18
Sand blast.....	553.71	.14			
Reaming.....	11,022.93	.28	Total (38,417 tons) .....	255,505.15	6.65



## APPENDIX C—Continued.

*McClintic-Marshall Construction Co.—Continued.*

RECORD FROM DEC., 1909, TO NOV., 1910.

Department.	Cost.	Rate per ton.	Department.	Cost.	Rate per ton.
Making templets.....	\$12,898.80	\$0.29	Subpunched reaming.....	16,423.68	.37
Making patterns.....	938.61	.02	Countersinking.....		
Unloading.....	6,040.37	.14	Machine riveting.....	33,648.24	.76
Plate straightening.....	2,564.69	.06	Hand riveting.....	11,751.13	.26
Running in.....	4,593.09	.10	Cut out and redrive rivets.....		
Stockyard.....	1,957.09	.04	Rotary planing.....	4,792.42	.11
Shearing.....	9,708.63	.22	Boring.....	909.20	.02
Laying off.....	13,581.38	.31	Caulk and riveting ladders.....		
Trucking in L. O. and P. Depts.....	6,430.77	.14	Grinding.....		
Punching.....	28,118.99	.63	Chipping.....	2,931.97	.07
Punching cont. washers.....			Blacksmith shop.....	6,774.48	.15
Drilling.....	1,625.82	.04	Machine shop.....	9,933.87	.22
Milling.....			Running out.....	4,966.11	.11
Edge planing.....	1,158.75	.03	Storing.....		
Bending and straightening.....	1,558.23	.04	Loading and bracing.....	5,211.19	.12
Fitting.....	52,105.46	1.17	Indirect labor.....		
Trucking in F. and R. Depts..	4,603.86	.10	Painting.....	7,948.45	.18
Making jigs.....	20.36				
Reaming.....	9,195.38	.21	Total (44,419 tons).....	262,391.02	5.91

*No. 2 shop, excluding Panama, December, 1910, to January, 1913, inclusive.*

[Contracts 4845-67 and 73.]

Department.	Cost.	Rate per ton.	Department.	Cost.	Rate per ton.
Making templets.....	\$1,942.74	\$0.14	Subpunched reaming.....	\$8,318.48	\$0.59
Making patterns.....	150.28	.01	Bulldozer.....	4.75	
Unloading.....	1,203.36	.09	Machine riveting.....	13,957.38	1.00
Plate straightening.....	445.94	.03	Hand riveting.....	8,701.58	.62
Running in.....	1,962.32	.14	Sand blast.....	528.30	.04
Oiling plates.....	10.51		Rotary planing.....	1,996.48	.14
Shearing.....	4,419.74	.32	Boring.....	522.85	.04
Laying off.....	4,966.35	.36	Calk and riveting ladders.....	304.02	.02
Trucking in L. O. and P. Depts.....	2,054.82	.15	Grinding.....	25.07	
Punching.....	9,980.01	.71	Chipping.....	2,126.97	.15
Punching cont. washers.....	19.76		Blacksmith shop.....	3,035.35	.22
Drilling.....	2,183.17	.16	Machine shop.....	7,346.74	.53
Pickling.....	757.65	.05	Running out.....	2,529.54	.18
Edge planing.....	1,045.75	.08	Storing.....	7.38	
Bending and straightening....	679.18	.05	Loading and bracing.....	2,551.15	.18
Fitting.....	22,728.24	1.62	Duplex milling.....	13.28	
Trucking in F. and R. Depts..	3,171.76	.22	Painting.....	1,718.20	.12
Making jigs.....	44.92				
Reaming.....	3,226.65	.23	Total.....	114,683.68	8.19





## REPORT OF COMMITTEE IN DETAIL.

### PART II.

Claim 6, page 67, of the original claim: This claim as originally stated by the Contractor was as follows:

6. Extra cost of erection due to conditions imposed upon the Contractor contrary to the contract requirements, also to conditions that caused extra expense, which should be borne by the Commission, to unreasonable inspection in the field, and to the necessity of completing the work within the time demanded, in spite of numerous delays caused by the Commission, and the extra work necessary on account of the conditions mentioned above and unreasonable inspection, \$1,325,091.

It has since been reduced to \$1,218,475.

The manner of arriving at the amount of claim 6 is shown on pages 73 to 85, inclusive, of the original claim. The amount of the claim is arrived at by taking the total actual erection expense incurred at Miraflores and deducting from such total actual erection expense the amount with which the Contractor thinks the Isthmian Canal Commission should be charged, to obtain what he claims to be the normal expense at Miraflores. This is shown as follows (see p. 75 of the claim):

Total erection expense incurred at Miraflores----- \$911, 259

From this should be deducted, for reasons given below, the following amounts, for which the Contractor holds the Commission responsible:

(a) Condition of yards and tracks-----	\$6, 753
(b) Bolting up with small holes, 37.8 per cent of \$153,303---	57, 950
(c) Reaming out the small holes, one-fourth of \$53,070-----	13, 270
(d) Water in lock chambers-----	5, 000
(e) Excess riveting, \$46,850 plus \$58,350 divided by 2-----	52, 600
(f) Excess grinding, three-fourths of one-third of \$119,900---	29, 966
(g) Excess cleaning, one-half of \$14,800-----	7, 428
(h) Rush work, 17,752 tons, at \$8 per ton-----	142, 000
	<hr/> 314, 967

Total normal expense----- 596, 292

To this normal cost at Miraflores the Contractor adds 50 per cent on eight leaves at Gatun and 30 per cent on eight leaves at Pedro Miguel, to cover the extra expense in getting the work started, or 10 per cent of the normal cost at both Gatun and Pedro Miguel, and adds to the total thus arrived at a proportion of the general expenses equal to the amount claimed as excess labor cost. (See p. 85 of the claim.)

After assuming that the normal cost of erection at Miraflores equals \$33.49 a ton has been established, the Contractor states his

method of arriving at the total amount of claim 6 as follows (see p. 85 of the claim):

It has been shown that the normal cost of erection at Miraflores should have been \$33.49 per ton.

The Contractor concedes that to get the work started at Gatun and Pedro Miguel a certain amount of excess cost should be allowed on the first leaves erected at these sites, and he has estimated that a liberal allowance on account of this would be 50 per cent on 8 leaves at Gatun and 30 per cent on 8 leaves at Pedro Miguel. This would make the normal cost both at Gatun and Pedro Miguel 10 per cent higher than the cost at Miraflores, or \$36.84 per ton.

The Contractor, therefore, claims that there is due him from the Commission the following amounts:

Gatun, 25,498 tons, at \$53.83, minus \$36.84, equals-----	\$433, 210
Pedro Miguel, 14,924 tons, at \$59.37, minus \$36.84, equals-----	336, 238
Miraflores, 17,752 tons-----	314, 967
Total -----	1, 084, 415
To this should be added an amount covering transportation, liability, and general expenses, which should be prorated in accordance with the actual total expenses and the Contractor's claim or $\$391,891 \times \$1,084,415 \div \$3,170,007$ equals -----	
	134, 060
	<hr/> 1, 218, 475

This is the total amount claimed by the Contractor as to the extra expenses he was put to at the Isthmus on account of the actions of the Commission.

The total of the above claim was originally \$1,325,091. (See p. 85 of the claim as originally printed.)

The reduction in the amount made by the Contractor was to eliminate duplication of the charge for rush work, as shown on page 75 of the original claim, and also in order to allow the proper credit for rivets and rivet rods that were discovered to have been disposed of by the Contractor in excess of the amount claimed in the original claim. (See pp. 78, 79, 80, and 81 of the original claim.)

The normal cost per ton at Miraflores, on the basis of the method used by the contractor at arriving at a total normal labor cost, as shown on page 75 of the claim, is \$33.59, instead of \$33.49, as claimed by the contractor. This is shown by dividing \$596,292 by 17,752, the number of tons at Miraflores. In order to find the correct normal at Miraflores, including the item of transportation, liability, and general expenses, there should be added to the normal cost per ton for labor the normal cost per ton for transportation, liability, and general expenses, page 85 of the claim. The actual amount of transportation, liability, and general expenses is \$391,891. The average amount per ton can be arrived at by dividing \$391,891 by 58,174, the number of tons involved. This would give \$6.74 a ton as the actual cost per ton for this item. The normal cost per ton of this item at Miraflores is found by multiplying the normal labor cost per ton—\$33.59—by the actual cost per ton for transportation, liability, and general expenses—\$6.74—and dividing the product by the actual labor cost per ton at Miraflores, which is \$51.33. This method would give \$4.41 as the normal cost per ton for transportation, liability, and general expenses at Miraflores. Four dollars and forty-one cents added to \$33.59 would give \$38 as the actual normal cost at Miraflores for labor and general expenses, on the basis of the contractor's claim. Ten per cent of the tonnage price thus arrived at at Miraflores should be added to find the normal cost per ton at Gatun and Pedro Miguel. Ten per cent of \$38 is \$3.80,



which would give the normal cost per ton at Gatun and Pedro Miguel as \$41.80. These normals applied to the tonnage at the various locks would give the actual normal expenses at the various locks.

The table below shows the number of tons at each lock, the normal cost per ton, and the total normal, including the transportation, liability, and general expenses:

	Total normal.
Gatun, 25,498 tons, at \$41.80 per ton-----	\$1, 065, 817
Pedro Miguel, 14,924 tons, at \$41.80 per ton-----	623, 823
Miraflores, 17,752 tons, at \$38 per ton-----	674, 576
Total -----	2, 364, 216

The tables below give an analysis of the Contractor's claim as it would be applying the normal cost per ton arrived at as above:

Actual expenditure for labor-----	\$3, 170, 007. 00
Actual general expenses -----	391, 891. 00

Total actual -----	3, 561, 898. 00
Less total normal -----	2, 364, 216. 00

Total of claim -----	1, 197, 682. 00
Actual price per ton, including general expenses:	

	Per ton.
Actual, Gatun, \$53.83+\$6.74-----	\$60. 57
Actual, Pedro Miguel, \$59.37+\$6.74-----	66. 11
Actual, Miraflores, \$51.33+\$6.74-----	58. 07
Total excess per ton, including general expenses:	
Actual, Gatun, \$60.57 — \$41.80 -----	18. 77
Actual, Pedro Miguel, \$66.11 — \$41.80-----	24. 31
Actual, Miraflores, \$58.07 — \$38.00-----	20. 07

Excess in claim:	
Gatun, 25,498 tons, at \$18.77-----	478, 597. 46
Pedro Miguel, 14,924 tons, at \$24.31-----	362, 802. 44
Miraflores, 17,752 tons, at \$20.07-----	356, 282. 64

Total -----	1, 197, 682. 54
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It will be noted from the above tables that the total amount of the claim thus arrived at would be \$1,197,682, instead of \$1,218,475, as shown by the method of computation used by the Contractor. The method of arriving at the normal on the basis of the Contractor's claim is more accurate than the method pursued by the Contractor.

In the first place, there is a difference of 10 cents a ton in the normal cost at Miraflores, and in the second place this method of computation charges the item of transportation, liability, and general expenses with its proportion of the admitted increase for starting the work at Gatun and Pedro Miguel.

On August 29, 1914, the Contractor requested Mr. Samuel Phillips Mitchell, of Philadelphia, to prepare an estimate covering what he thought the erection of the lock gates of the Panama Canal should have cost. On September 16, 1914, Mr. Mitchell submitted an estimate covering the cost of erecting the lock gates. (See testimony of Mr. Mitchell of Aug. 31, 1915, vol. 33.)

The testimony of Mr. Mitchell in connection with the preparation of this estimate and how he came to submit it is quoted in full below:

Mr. STERRETT. What is your name?

Mr. MITCHELL. Samuel Phillips Mitchell.

Mr. STERRETT. What is your business?

Mr. MITCHELL. My business is that of consulting engineer, particularly with relation to the construction of large bridges and steel structures, and in this

connection I furnish estimates of the cost of erection for the purpose of bidding to large construction companies.

I am at the present time engaged as consulting engineer by the St. Lawrence Bridge Co. on the construction of the Quebec Bridge for the Canadian Government.

I am, further, president of the Seaboard Construction Co., which company is engaged in the construction of large bridges and structures in steel and concrete.

Mr. STERRETT. Where is your office located?

Mr. MITCHELL. No. 1024 Witherspoon Building, Philadelphia, Pa.

Mr. STERRETT. Will you please state your previous experience in connection with the manufacturing and erecting of large steel structures, both bridges and buildings?

Mr. MITCHELL. My first experience in connection with bridge construction was as inspector of bridges for the Baltimore & Ohio Railroad Co. during the construction of their Philadelphia branch, 1885-1887.

1887-1889, as assistant engineer for the Edge Moor Bridge Works, particularly in charge of the erection of a bridge over the Missouri River at Omaha, Nebr.

1889-90, as engineer of erection of the Edge Moor Bridge Works in charge of all outside construction work and erection.

1890-1896, as assistant manager of the Edge Moore Bridge Works, having direct charge of the drafting department, the shop or fabricating department, and the erection department.

1896-1900, as manager of the Edge Moor Bridge Works, with practically the same duties as just above stated.

1900-1901 as erecting engineer of the American Bridge Co.

1901-1906 as chief engineer of the American Bridge Co. of New York, having charge of all outside erection and construction work.

1906 to the present time have been engaged in practice as consulting engineer on large bridge work and steel construction work, and as president of the Seaboard Construction Co.

Mr. STERRETT. Have you had any experience in the manufacturing and erection of lock gates similar to those constructed for the Panama Canal?

Mr. MITCHELL. No; particularly as no lock gates comparable to the Panama Canal gates have previously been built.

Mr. STERRETT. Were you asked to prepare an estimate by the McClintic-Marshall Construction Co. of what you thought the erection of the Panama Canal lock gates ought to have cost?

Mr. MITCHELL. Yes; I was asked to prepare an estimate of what, in my opinion, should be the cost of erection of the lock gates for the Panama Canal in a letter from the McClintic-Marshall Construction Co. dated August 29, 1914, and also in a letter dated September 9, 1914.

Mr. STERRETT. Have you those letters with you?

Mr. MITCHELL. I have, and I submit them herewith.

(The letter from McClintic-Marshall Construction Co. to Mr. S. P. Mitchell dated Aug. 29, 1914, was made Exhibit No. 1—Mitchell.)

(The letter from McClintic-Marshall Construction Co. to Mr. S. P. Mitchell, dated Sept. 9, 1914, was made Exhibit No. 2—Mitchell.)

Mr. STERRETT. Did you have a copy of Circular No. 576 and the plans that were submitted to bidders to prepare estimates originally, when you made your estimate?

Mr. MITCHELL. Yes; I did.

Mr. STERRETT. Did you prepare your estimate on a basis of what was called for in circular No. 576 and the plans?

Mr. MITCHELL. I prepared my estimate on the basis of the plans and specifications submitted, with the understanding that the character of work required was to be of the quality of high-grade structural, bridge, or ship work, taking into consideration the requirement that the work was to be made water-tight.

In preparing my estimate—and as stated in my letter of September 16, 1914, submitting the estimate to you—I endeavored to look upon the matter from the point of view as though the estimate were to be used for the purpose of bidding on the work.

Mr. STERRETT. Were you furnished by the Contractor the scale of wages that was paid for labor at the time the canal gates were erected; and if so, what were those rates?

Mr. MITCHELL. I was furnished with a statement from the Contractor as to the wages paid during the construction of the lock gates, which information was as follows:



Bridgemen taken from the United States, 60 to 65 cents per hour, and applying to from 500 to 600 men, and for colored labor, wages ranging from 16 to 40 cents per hour and averaging 25 cents per hour, applying to about 4,000 men.

Mr. STERRETT. Did you consider, in preparing your estimate, the possible inefficiency of labor in a tropical climate?

Mr. MITCHELL. I took this matter into consideration and tried to cover it in preparing my estimate.

Mr. STERRETT. What experience have you had in handling the erection of large steel structures and bridges in tropical climates?

Mr. MITCHELL. During the time that I was chief engineer of the American Bridge Co., of New York, and coming under my direct charge, we had construction work going on in Yucatan, Mexico, Peru, and a large number of viaducts on the Uganda Railway Co. in British East Africa.

Mr. STERRETT. At the time you prepared your estimate, Mr. Mitchell, did you have any knowledge of the original estimate made by the Contractor at the time he bid on the work, or of the actual cost of the work, or any knowledge whatever in connection with the claim made by the McClintic-Marshall Construction Co. against the Isthmian Canal Commission for extra compensation in connection with the construction of the Panama Canal lock gates?

Mr. MITCHELL. At the time I prepared my estimate I had no knowledge whatsoever of the estimate prepared by the McClintic-Marshall Construction Co. used in their bid for the Panama Canal lock gates, nor any knowledge whatsoever as to the actual cost of performing the work; nor have I any knowledge whatsoever as to the estimated and actual cost at the present time. I further had or have no knowledge as to the claim for extra compensation presented by the McClintic-Marshall Construction Co. to the Isthmian Canal Commission further than what I read in the newspapers at the time the claim was presented.

Mr. STERRETT. That is, Mr. Mitchell, you have no knowledge at the present time or had at any other time as to what the Contractor claims the erection should have cost?

Mr. MITCHELL. I never had or have any such knowledge.

Mr. STERRETT. When did you submit your estimate in accordance with the request of the Contractor?

Mr. MITCHELL. My estimate was submitted with my letter dated September 16, 1914.

Mr. STERRETT. Have you a copy of the estimate and your letter with you?

Mr. MITCHELL. I have, and submit it herewith.

(The letter of Sept. 16, 1914, from Mr. Mitchell to McClintic-Marshall Construction Co. and the estimate attached was marked "Exhibit No. 3—Mitchell.")

Mr. STERRETT. Can you certify that the copy of the estimate which is being submitted as Exhibit No. 3 of your testimony is correct with your original copy which you prepared and on which the total amount of your estimate amounts to \$2,684,200.

Mr. MITCHELL. I have compared copy of estimate designated as Exhibit No. 3 with the original file copy of my estimate and will verify the estimate designated as Exhibit No. 3 as being a true and exact copy of the estimate prepared by me and now on file in my office.

Mr. STERRETT. On sheet 2 of your estimate, Mr. Mitchell, you have an item of field expense amounting to \$150,000, in which you state includes superintendence, clerical force, watchmen, and undistributed labor. What do you mean by this item of "field expense"?

Mr. MITCHELL. This item of field expense is intended to cover the wages of superintendents, foremen, office force, watchmen, machinists, repairmen, and general labor which is always required on large construction work and not properly chargeable to any of the fixed distributive items, such as erecting gates, bolting up, reaming, riveting, calking, etc.

Mr. STERRETT. In the total cost you state, "Exclusive of general administrative expense." What was your reason for not including "general administrative expense"? Was it because you were told that in the case of the Contractor this charge was taken care of in connection with shop labor and there was no charge against fieldwork?

Mr. MITCHELL. This was the information given me at the time the estimate was prepared, consequently the general administrative expense was not included in my estimate of the field cost.

Mr. STERRETT. During the construction of the lock gates on the Isthmus by the Contractor had you any direct knowledge either then or since as to the conditions under which the Contractor was required to work that might possibly be contrary to the plans and specifications?



Mr. MITCHELL. I had no such knowledge.

Mr. STERRETT. What would be your opinion, Mr. Mitchell, in connection with the cost and the time and the riveting of three gates if the holes in the material in the shops were punched so small that it had to be assembled in the field before reaming with five-eighths-inch bolts, which the Contractor claims was required of him contrary to the specifications, as the specifications stated all material shall be punched one-eighth inch less than the size of the rivet used, understanding that the rivets used were seven-eighths inch, 1 inch, and  $1\frac{1}{8}$  inch.

Mr. MITCHELL. In my opinion, the requirement that the steelwork be assembled with five-eighths-inch bolts before reaming would very materially add to the cost of assembling, reaming, and riveting, and also very much increase the time required for doing this work.

As I understand the situation the parts were assembled and first bolted up with five-eighths-inch-diameter bolts, and the holes were then reamed to full size required for seven-eighths-inch, 1-inch, and  $1\frac{1}{8}$ -inch diameter rivets, as the case might be.

I do not consider that five-eighths-inch diameter bolts would have sufficient strength to draw the parts tightly together, and hold them in that position, as bolts of this size would stretch and allow the parts to spring apart, the result being that when the holes were reamed chips and borings would get in between the parts and prevent them from being tightly drawn together later on with larger bolts.

In order to secure tight rivets, it is of the very greatest importance that the parts to be riveted be tightly drawn together and held until the rivets are driven, and I do not believe this could be accomplished successfully with the five-eighths-inch diameter bolts.

Mr. STERRETT. In article 121 of the specifications, Circular 567, it states under the requirements for bolting up: "In the field erection the separate parts shall be tightly bolted together, using bolts in practically all of the holes, and the rivet and bolt holes shall then be reamed out to their full size." Do you consider that requirement practicable?

Mr. MITCHELL. If practically all the holes were filled with bolts at one time, there would be no open holes left for reaming; consequently I do not see how it would be really practicable to carry out this requirement. The common practice in this particular is to fill about 50 per cent of the holes with fitting-up bolts.

The estimate submitted by Mr. Mitchell was as follows:

*Estimate of erection for lock gates, Panama Canal, Sept. 16, 1194.*

LABOR ITEMS.

	Net labor cost.
Yard labor-----	\$46, 800
Erection bridges, including erecting, removing, and moving same----	15, 400
Temporary supports-----	32, 200
Erecting gates, including frame and skin plates-----	312, 000
Bolting up before reaming and rebolting for riveting-----	260, 000
Reaming-----	208, 000
Riveting-----	458, 400
Caulking-----	81, 600
Grinding end plates and setting end reaction castings, including drilling and bolting-----	64, 400
Setting and habbiting nickel steel bearing plates-----	58, 000
Placing pintles and yokes and setting leaves on pintles-----	46, 000
Placing wooden sills and fenders-----	5, 300
Placing concrete in bottom of gates-----	4, 500
Placing piping, etc., for pumping system-----	13, 800
Placing sidewalks and railings-----	8, 200
Placing manhole covers and doors-----	10, 600
Cleaning gates and applying two coats red-lead paint on outside only--	65, 000
Field expense, including superintendence, clerical force, watchmen, and undistributed labor-----	150, 000
Total labor cost-----	1, 840, 200
Total weight of gates, 58,170 tons, at \$31.64 per ton.	



EXPENSE ITEMS.

Field expense, including general items of expense in the field-----	\$75, 000
Transportation of men and equipment-----	70, 000
Power (furnished free).	
Erection materials, including erection bridges, bolts, and other items of material not included in plant-----	160, 000
Use and depreciation of erection plant-----	147, 000
Insurance-----	92, 000
Contingencies -----	300, 000
Total expense -----	844, 000

Total weight of gates, 58,170 tons, at \$14.51 per ton.	
Total labor cost, from sheets Nos. 1 and 2 (pp. 262 and 263 of this report) -----	1, 840, 200
Total expense, from sheet No. 3 (pp. 263 and 264 of this report) -----	844, 000
Total cost, exclusive of general administrative expense-----	2, 684, 200
Total weight of gates, 58,170 tons, one-half \$46.15 per ton.	

Under labor items in the above estimate, \$150,000 is specified for field expenses, which are stated to include expenses of superintendence, clerical force, watchmen, and undistributed labor. This class of expenses corresponds to the expenses in special No. 21, salaries, and Dock No. 41 on blue print showing labor cost of erection at the Isthmus, volume 26 of the evidence. The proportion of the labor expenses incurred on the Isthmus under special No. 21, salaries, Dock No. 41, and distributed to the various items on the blue print referred to above are shown in the table below :

	Amount.	Per cent.	Per ton.
Gatun (25,498 tons):			
Distribution.....	\$1, 086, 201. 47	79. 0782	\$42. 599
Special No. 21.....	166, 043. 95	12. 0884	6. 512
Salaries.....	116, 714. 62	8. 4971	4. 577
Dock No. 41.....	4, 618. 56	. 3363	. 181
	1, 373, 578. 60	.....	53. 869
Pedro Miguel (14,924 tons):			
Distribution.....	700, 122. 06	79. 0191	46. 912
Special No. 21.....	108, 257. 43	12. 2184	7. 253
Salaries.....	74, 648. 88	8. 4252	5. 002
Dock No. 41.....	2, 988. 48	. 3373	. 200
	886, 016. 85	.....	59. 367
Miraflores (17,752 tons):			
Distribution.....	689, 989. 48	75. 7188	38. 868
Special No. 21.....	141, 402. 49	15. 5173	7. 965
Salaries.....	76, 805. 32	8. 4285	4. 326
Dock No. 41.....	3, 056. 40	. 3354	. 172
	911, 253. 69	.....	51. 331

The table below shows the totals of special No. 21, salaries, and Dock No. 41 at each lock, and the total normal and total excess expenses at each lock for these items under contractor's method of stating his claim :

	Total ex- penditure.	Normal.	Excess.
Gatun.....	\$287, 375. 00	\$198, 317. 49	\$89, 057. 51
Pedro Miguel.....	185, 893. 00	117, 540. 14	68, 352. 86
Miraflores.....	221, 263. 00	144, 794. 51	76, 468. 49
Total.....	694, 531. 00	460, 652. 14	233, 878. 86

To get these figures, we apply the following percentages: 63.23 per cent—normal at Pedro Miguel, 36.77 per cent excess at Pedro Miguel; 69.01 per cent—normal at Gatun, 30.99 per cent excess at Gatun; 65.44 per cent—normal at Miraflores, 34.56 per cent excess at Miraflores.

The difference between the admitted normal expenses carried under special 21, salaries and Dock 41 in the Contractor's distribution of cost, and the same item of field expenses carried in Mr. Mitchell's estimate, is \$310,352. Mr. Mitchell's estimate for labor items should therefore be increased by \$310,352 in this item.

The proportion of this \$310,352 that should be applied to Miraflores is \$89,215. Eighty-nine thousand two hundred and fifteen dollars divided by 17,752 would give \$5.02 a ton, which should be added to \$31.64, the total of Mr. Mitchell's estimate, making the tonnage price for labor at Miraflores \$36.66 on the basis of Mr. Mitchell's estimate after being increased. This would be equivalent to an increase in the assumed normal of the Contractor at Miraflores of \$3.07. The normal price per ton for transportation, liability, and general expenses should be increased proportionately.

Under the method shown for obtaining the normal cost per ton for transportation, liability, and general expenses shown on page 255, the normal cost for such at a labor cost of \$36.66 would be \$4.81. The Contractor's normal cost at Miraflores has been increased from \$33.59 to \$36.66, or by 9 per cent. Nine per cent of \$4.81 should therefore be added to increase the normal general expenses in proportion to the increase in the normal labor expenses. When this is added, it will give a normal cost per ton at Miraflores for labor and general expenses of \$41.90.

We should add to this normal 10 per cent to obtain the normal cost per ton at Pedro Miguel and Gatun.

The first table below gives the actual cost per ton at the three lock sites, the normal cost per ton at the three lock sites, and the excess cost per ton at the three lock sites. The second table gives the total actual expenditures at the actual cost per ton at the three lock sites, the total normal expenditures at the normal cost per ton at the three lock sites, and the total excess expenditures at the excess cost per ton at the three lock sites.

TABLE No. 1.—Cost per ton.

	Actual.	Normal.	Excess.
Gatun.....	\$60.57	\$46.09	\$14.48
Pedro Miguel.....	66.11	46.09	20.02
Miraflores.....	58.07	41.90	16.17

TABLE No. 2.

	Actual expenditure at actual cost per ton.	Normal expenditure at normal cost per ton.	Excess expenditure at excess cost per ton.
Gatun.....	\$1,544,413.86	\$1,175,202.82	\$369,211.04
Pedro Miguel.....	986,625.64	687,847.16	298,778.48
Miraflores.....	1,030,858.64	743,808.80	287,049.84
Total.....	3,561,898.14	2,606,858.78	955,039.36



If Mr. Mitchell's estimate, increased as shown above, should be adopted as the proper normal it would have the effect of reducing the claim of the Contractor, as finally revised, from \$1,218,475 to \$955,039.36, or a total reduction of \$263,435.64. (See p. 254 of this report for claim 6 of the Contractor, as revised by him.) Under the method of stating the claim on the basis of the Contractor, as modified on pages 255 and 256 of this report, his claim would be for \$1,197,682.54, and under the estimate of Mr. Mitchell, when increased as above, it would be for \$955,039.36. This increase in the estimate of Mr. Mitchell, if his estimate as increased is taken as a normal, would have the effect of reducing the claim \$242,643.18 below the last figure.

The excess per ton claimed by the Contractor for bolting up at Miraflores is \$3.27. The excess claimed for reaming is 74 cents a ton. This makes a total, in round numbers, of \$4 a ton. The percentage of excess at Miraflores, under the Contractor's original claim, is 34.56 per cent; the percentage at Pedro Miguel is 36.77 per cent; and the percentage of excess at Gatun is 30.99 per cent. The amount of excess per ton that should apply at Pedro Miguel is found by multiplying the excess per ton at Miraflores by the percentage of excess per ton at Pedro Miguel and dividing the product by the percentage of excess at Miraflores. This would give \$4.28 a ton to be applied as the excess for bolting up and reaming at Pedro Miguel. The same process at Gatun would give the excess per ton to be applied at Gatun as \$3.58. There were 1,858.4 tons in the 54-foot 8-inch leaves at Gatun. This multiplied by \$3.58 would give \$6,653.07 as the excess for bolting up and reaming these leaves at Gatun. There were 1,852.2 tons in the 54-foot 8-inch leaves at Pedro Miguel. This multiplied by \$4.28 would give the amount of excess to be applied on these leaves at Pedro Miguel. If the \$955,039.36 is to be taken as the amount of the excess above the normal it would equal 78.3 per cent of the claim of the Contractor as finally revised. The amount of excess at Gatun and Pedro Miguel on the 54-foot 8-inch leaves for bolting up and reaming is found by taking 78.3 per cent of the excess at Gatun and Pedro Miguel, found as above. This would give the excess to be deducted from \$955,039.36 as \$11,426.56; \$11,426.56 deducted from \$955,039.36 would leave \$943,612.80 as the excess of the claim, taking the estimate of Mr. Mitchell, increased as above, as the normal, and working out the claim on the principles stated by the claimant in the original book of claims.

If this should be taken as the minimum normal cost of erection, exclusive of equipment, it would amount to \$45 a ton. This is found as follows: The total actual expenses, including the item of labor expense and the item of transportation, liability, and general expenses, is \$3,561,898. Deduct from this \$943,612.80, excess, and it will leave \$2,618,285.20 as the total normal expense for these items. This divided by 58,174 would give \$45 per ton as the normal, exclusive of equipment.

Mr. J. W. Wright, who was formerly superintendent for the McClintic-Marshall Construction Co., when the question of erection of dock gates came up, claimed that they could be erected more economically than similar gates could be erected by a contractor, in so far as the cost to the Panama Canal is concerned. (See testimony



of Mr. Hinman, vol. 36, p. 3.) His estimate for the erection of the dock gates is \$41.85 a ton.

Mr. Childers, who had been connected with the lock gates as one of the employees of the Contractor during the erection of the gates and was supposed to be familiar with the cost of erecting the lock gates, submitted an informal price of \$58 per ton for erecting the dock gates.

Mr. Hinman, in his testimony, page 3, estimates, based on the labor-cost estimate by Mr. Wright and upon Mr. Faure's cost sheets, that the dock gates would be completed for about \$70 per ton, including inspection, freight, transportation, and power.

Mr. Wright thinks that if he had charge like he had at the lock gates that he could have put them up at a labor cost of from \$25 to \$30 per ton. (See pp. 16 and 17 of his testimony, vol. 36.) This estimate of Mr. Wright, however, must be considered in connection with the former estimate of \$41.85 per ton for labor and also in connection with the fact that the gates are actually costing to erect them, for labor, almost 25 per cent more than this estimate.

The total estimated cost of the lock gates made by Mr. Goldmark was between \$6,500,000 and \$7,000,000. (See his testimony, vol. 8, pp. 243 to 245.)

In view of the many exceptional conditions effecting the erection of the lock gates, such as the necessity of organizing and controlling a large force for the purpose of erecting the gates in a tropical climate, and the fact that it was practically a new class of work and that the laborers and employees would necessarily be inexperienced in that class of work in the beginning, it is not believed from all the testimony that your committee would be justified in fixing a normal cost of erection as a basis for examining the claim in the way in which it has been stated by the Contractor at less than \$45 a ton as a whole, or \$41.90 at Miraflores and \$46.09 at Pedro Miguel and Gatun. (See p. 266 of this report.)

These prices per ton will be taken as the ones best supported by the evidence and as the extreme minimums which your committee feels would be justified.

The various contentions made by the Contractor as affecting the cost of the work, and his specific claims as to the increased cost stated on page 75 of the original book of claims will now be considered.

CLAIM A.—*Condition of yards and tracks, Miraflores, \$6,753.*

The method adopted by the Contractor for placing a money value on the various claims that are insisted upon in connection with the erection at the isthmus is shown on page 253 of this report, which sets out the way in which the normal at Miraflores is arrived at. The claim stated above is considered, together with the claim for water in lock chambers, by the Contractor on pages 39, 40, 41, 42, 43, 44, 45, and 46 of the original claim. The brief of the Contractor, pages 91 to 101, inclusive, gives a reference to the testimony that has been submitted in connection with this claim, and it has been submitted in support of the following contention, viz (see p. 39 of the claim):

Third. That the Commission failed to furnish, in accordance with the terms of the contract, sufficient and suitable unoccupied storage grounds on the isthmus for the material of the Contractor.



Paragraph 115 of the specifications provides that—

115. For the storage of material the Commission will furnish the Contractor, free of charge, suitable unoccupied lands convenient to the several lock sites, properly graded and provided with sufficient railroad tracks of 5-foot gauge. It will also, at its own expense, construct and maintain a railroad track close to one of the side walls of the locks, and, wherever feasible, along the whole or a part of the other wall. It will also furnish free all necessary switching service from the storage grounds to the different gate sites and provide the Contractor for use on the work with a reasonable number of flat cars of 5-foot gauge without charge for same.

Paragraph 118 of the specifications provides that—

118. Before beginning erection, the Contractor shall submit in duplicate for approval a detailed description with sketches of the method of erection proposed. No erection shall be done until the chief engineer or his authorized representatives has approved the method in writing.

These provisions in the specifications were made a part of the contract. (See Art. V of the contract.)

Article 2 of the original contract provided the dates for beginning and completing the erection of the gates. It also contained this provision:

*Provided*, That any delay caused by the Commission in the manufacture, shipment, delivery, or erection of any gate and the fixed parts for same covered by this contract shall be added to the period agreed upon for the erection of such gate and fixed parts; the date arrived at by such addition shall be the date for completing the erection of such gate and fixed parts, and the rights of the parties hereto shall be determined precisely as though the date thus fixed was the date originally agreed upon: *And provided further*, That any delay caused by the Commission in the manufacture, shipment, or delivery of any material for the spare parts covered by this contract shall be added to the period agreed upon for the delivery of such material for spare parts; the date arrived at by such addition shall be the date for completing the delivery of such material for spare parts, and the rights of the parties hereto shall be determined precisely as though the date thus fixed was the date originally agreed upon.

If any gate and the fixed parts for same are not completely erected on or before the date fixed as above for their erection, one-tenth of 1 per cent of the contract price of such gate and fixed parts shall be deducted for each day's delay as liquidated damages for the delay until satisfactory erection or performance shall have been made or until such time as the Commission may otherwise reasonably complete the erection of such gate and fixed parts for same, and if any material for the spare parts is not delivered on or before the date fixed as above for its delivery, one-tenth of 1 per cent of the contract price of such material for spare parts shall be deducted for each day's delay, as liquidated damages for the delay, until satisfactory delivery or performance shall have been made: *Provided, however*, That delays caused by strikes, acts of God, or public enemies, to the extent to which the same, in the judgment of the Commission, may justify the delay, shall not be charged against the Contractor hereunder.

It is further understood, covenanted, and agreed that the Commission may delay the commencement of the erection of any or all of the gates and fixed parts for the reason that it has not completed the masonry or the fixed iron-work, or for any other reason it may deem sufficient to justify such action, and if at any time the Commission shall deem it necessary so to do, it may suspend the work of erection on any or all of the gates and fixed parts covered by this contract, in which case the Contractor shall, without expense to the Commission, properly cover over, secure, and protect such of the work as may be liable to sustain injury from the weather or otherwise. The Commission may also direct the order in which the different gates and fixed parts in a given lock shall be erected, and it may require that any gate and the fixed parts necessary for same in any twin flight of locks shall be completely erected on or before a date fixed herein for the erection of any other gate in such twin flight of locks, and in such case the provisions of this contract relative to liquidated damages

for delay shall subsist, take effect, and be enforceable in the same manner and to the same extent as if the date thus fixed was originally specified herein: *Provided*, That in all such cases the Contractor shall be granted an extension of time within which to complete the erection of any or all gates so delayed in erection, equal to the period of any delay caused by any such delays in the commencement of erection, suspension of work, or change of dates, but he shall not be entitled to any payment as additional compensation or as damages on account of any such suspension of work, delay in commencement of erection, or change in time or order of erection of gates.

No specific allowance for additional time was made under the above provision until the supplemental contract, dated May 20, 1913, was entered into. This supplemental contract undertook to take up the question of allowance for additional time, change in the dates, and the order in which the gates should be completed. For easy reference it is quoted below :

[W. O. 23444—supplemental, Z. R. 4318-A.]

This contract, entered into this 20th day of May, 1913, between the Isthmian Canal Commission, hereinafter called the Commission, and the McClintic-Marshall Construction Co., of Pittsburgh, Pa., a corporation organized and existing under the laws of the State of Pennsylvania, hereinafter called the Contractor, supplemental to a contract entered into by and between the same parties under date of June 21, 1910, covering the furnishing of material and the erection of the lock gates for the Panama Canal, under W. O. 23444, and also to the supplemental contract modifying the conditions in regard to payments entered into under date of January 14, 1913, witnesseth :

Whereas the original contract provides for the completion of the gates for the locks of the Panama Canal on various dates ranging from November 1, 1911, to June 1, 1913; and

Whereas the Contractor has failed to complete the lock gates in accordance with the dates fixed for their completion in the original contract; and

Whereas the original contract provides that for delays caused by the Commission and by strikes, acts of God, or public enemies additional time shall be allowed for such delays; and

Whereas the Contractor claims that it has been delayed in the completion of the various lock gates on account of causes for which it is excusable under the terms of the contract, so as to make the dates of completion of the various groups of gates as compared with the dates fixed by the original contract to be as set forth in the following table :

Gates.	Original contract dates for completion.	Dates fixed for completion if contractor's claims were allowed.
Gatun:		
Lower guard gates.....	Feb. 1, 1913	Dec. 9, 1913
All other west-side gates.....	do.....	Do.
All other east-side gates.....	do.....	Do.
Pedro Miguel:		
Upper guard gates.....	Jan. 1, 1912	June 26, 1912
Lower guard gates.....	May 1, 1912	May 2, 1912
All other east-side gates.....	do.....	Do.
All other west-side gates.....	do.....	May 2, 1913
Miraflores:		
Upper guard gates.....	Sept. 1, 1912	May 6, 1913
Lower guard gates.....	June 1, 1913	Apr. 8, 1914
All other west-side gates.....	do.....	Do.
All other east-side gates.....	do.....	Do.

And

Whereas the Contractor is entitled to a considerable part of the additional time it claims; and



Whereas the allowance of any considerable length of time for the completion of the lower guard gates at Gatun, the two lower guard gates at Miraflores, and certain other gates, the completion of which is necessary in order to permit any use of the canal, will delay the completion and opening of the canal long past the essential dates determined upon by the Commission and will otherwise greatly damage the Commission by interfering with the orderly prosecution of other work now under contract and hereafter to be done by the Commission; and

Whereas it will be difficult to determine the exact time that should be allowed upon the claim made by the Contractor; and

Whereas it is desired and is essential to the satisfactory prosecution of the work that the two lower guard gates at Gatun, lower lock, the two upper guard gates and the two lower guard gates, lower lock, at Miraflores shall be completed at the earliest possible date, and a good many months earlier than the dates by which under the original contract the Contractor could be required to complete them were the claims for delay to be allowed as made; and

Whereas the Contractor has now become liable for an uncertain amount of liquidated damages after the allowance of all the time to which it would be entitled under the original contract; and

Whereas it would be greatly to the benefit of the Commission to agree upon dates for the completion of the various gates to be substituted for the dates given in the original contract; and

Whereas the original contract provides for the assessment of liquidated damages for failure to complete each gate on the date specified in the contract on the basis of one-tenth of 1 per cent of the contract price of such gates for each day of delay; and

Whereas the failure to complete certain of the intermediate gates on the dates fixed in the contract would not result in any appreciable damages to the Commission; and

Whereas the failure to complete certain other gates upon the dates determined in accordance with the terms of the contract would result in damages to the Commission far in excess of the rates specified in the contract; and

Whereas there are certain well-defined groups of gates in each lock, and the completion of all gates in such groups at a specified time is necessary to enable proper use of certain portions of the canal; and

Whereas the Contractor, as one of the considerations for entering into this agreement, has agreed to the insertion of a provision fixing the rate of liquidated damages for each day's delay in completion of the various groups of gates at a higher rate than that specified in the original contract; and

Whereas the Commission has had the free use of the erection bridges of the Contractor for transferring material to the center walls of the various locks and for crossing from one side of the locks to the other; and

Whereas the use of such bridges in the past and their use in the future for such purposes has been and will continue to be a valuable consideration; and

Whereas the Contractor, in view of the matters hereinafter set forth, and as a part of the consideration for this agreement, has agreed to make no charge for the use of its erecting bridges; and

Whereas the Contractor has agreed to perform additional work on the material for the dock gates covered by contract between the same parties entered into under date of October 22, 1912, without additional compensation, and has further agreed to make certain other concessions in connection therewith.

Now, therefore, in consideration of the premises and all other matters hereinafter set forth, it is mutually agreed that the original contract shall be and the same is hereby modified as follows:

The Contractor shall complete the various gates at the earliest possible date and in any case on or before the dates set out in the table below so that they may be operated to the entire satisfaction of the chairman and chief engineer of the Commission, and so that it will not be necessary in the opinion of said chairman to keep the locks free from water, or free the locks from water after is has been turned in, for the purpose of completing the gates in every detail as required by the specifications.

Gatun:

Lower guard gates	June 15, 1913
Upper guard gates	Oct. 1, 1913
All other west-side gates	Oct. 1, 1913
All other east-side gates	Jan. 1, 1914



## Pedro Miguel :

Upper guard gates -----	June 1, 1913
Lower guard gates -----	June 1, 1913
All other east-side gates -----	Oct. 1, 1913
All other west-side gates -----	Jan. 1, 1914

## Miraflores :

Upper guard gates -----	June 15, 1913
Lower guard gates -----	Sept. 1, 1913
All other west-side gates -----	Oct. 1, 1913
All other east-side gates -----	Mar. 1, 1914
All spare parts shall be delivered -----	Aug. 15, 1913

It is understood and agreed that time is of the very essence of this supplemental agreement, and that failure to complete all of the gates in any group on or before the date specified above for such group will result in great damage to the Government and will prevent the completion and use of particular portions of the Panama Canal, and that it will be impossible to determine the amount of the actual damage which will be sustained by the Government on account of the nature of the work under construction, and that if any of the gates in any of the 12 groups of gates are not completely erected on or before the date fixed as above for their erection to the extent as above provided (that is, so that the gates may be operated to the entire satisfaction of the chairman and chief engineer, and so that it will be necessary in the opinion of said chairman and chief engineer to keep the locks free from water, or free the locks from water after it has been turned in, for the purpose of completing the gates in every detail), the damages which will be caused the Commission by reason of such failure shall be and are hereby liquidated and fixed in the sum of one-eighth of 1 per cent of the contract price of all gates in the group so delayed in erection for each day of delay in completion of all the gates in such group until they are completed to the extent as above provided, and that the amount of the damages thus determined may be deducted by the Commission from any payments hereafter made to the Contractor, or may be collected from the Contractor or its sureties.

It is further understood and agreed that the above provisions fixing new dates for completion of the various gates and providing a new basis for determining the amount of liquidated damages due in case of delay in completion of the gates after such dates, shall constitute a full and final settlement of all and any claims on account of delays and of all and any such claims for damages which have heretofore arisen or which may arise out of any delays which have occurred prior to the date of this contract, either on the part of the Contractor or on the part of the Commission, and that the determination of the causes of any delays in completion of any part of the work covered by this contract which may occur after the date hereof, and whether the Contractor is entitled to additional time within which to complete any part of the work shall be made in the manner and under the conditions provided in the original contract of June 21, 1910.

The Contractor also agrees to deliver to the Commission either at Washington, D. C., or on the Isthmus, at the option of the Commission, before final payment is made, all the tracings of the Contractor's shop drawings for the lock gates.

It is further understood and agreed that if, in the judgment of the chairman and the chief engineer of the Commission, the Contractor should neglect or fail to so prosecute the work as to make it impossible for it, in the opinion of said chairman and said chief engineer, to complete any of the various parts of the work on any of the dates agreed upon, the Commission shall have the right to employ such labor and perform such services in connection with the prosecution of the work of the Contractor as the said chairman and chief engineer may deem necessary to secure completion by the dates fixed. The cost of such labor and services shall be charged to the Contractor and deducted from any payment to be made to it, or may be collected from the Contractor or its sureties.

The exercise of this option by the Commission shall not be considered as in any way relieving the Contractor from its liability to respond in damages in case it is still unable with the aid of the Commission to complete any of the groups of gates upon the dates specified; nor shall it relieve the Contractor from any of the other provisions of the original contract as modified by this supplemental agreement.



It is further understood and agreed that the concessions made by the Contractor in the agreement of even date herewith, supplemental to an agreement entered into by and between the Commission and the Contractor, under date of October 22, 1912, Washington Order No. 35042, for the furnishing of material and the erection of dock gates at Balboa shall be, and are hereby, made a part of the consideration for any concessions which may have been made by the Commission in this supplemental agreement.

It is also understood and agreed that, as a part of the consideration moving to the Commission for the changes specified above, in the settlement under the contract between the same parties hereto, dated September 11, 1911 (W. O. 28323), any and all delays in the delivery of the material, which, in the judgment of the chairman and chief engineer, or his authorized representative, causes no damage or inconvenience to the Government when expressly waived by the chairman and chief engineer, or his authorized representative, shall be charged against the Contractor.

Except as herein specifically modified, the original contract, Washington Order No. 23444, dated June 21, 1910, is modified by the supplemental contract of January 14, 1913, Washington Order No. 23444 (supplemental), shall remain in full force and effect, and A. W. Mellon and R. B. Mellon, as sureties on said original and supplemental agreements hereby specifically consent to the modification of the contract as herein set forth.

In witness whereof, the parties hereto have executed this contract in triplicate as of the day and year first above written.

Witness to signature:

B. F. HARRAH, as to—

ISTHMIAN CANAL COMMISSION.  
By F. C. BOGGS,  
*Major, Corps of Engineers, U. S. Army.*  
McCLINTIC MAR. CON. COMPANY,  
By C. D. MARSHALL, *As its President.*

Attest:

N. S. MITCHELL. [SEAL.]  
*As its Secretary.*

In the presence of:

A. E. SEXSMITH.	R. B. MELLON,	[L. S.]
A. E. SEXSMITH.	H. W. MELLON,	[L. S.]

I certify to the correctness of the facts.

P. B. CLARK,  
*Acting Chief Clerk, Purchasing Department.*

Article 10 of the original contract provides as follows:

ARTICLE X. The Contractor agrees to make no claim for compensation for any extra work, labor, or materials over and above that specified or called for in the contract, specifications, and plans, unless same shall have been agreed upon in writing by the parties to the contract before such work shall have been commenced or the labor or materials furnished.

Article 12 of the original contract provides as follows:

ARTICLE XII. All questions relating to final inspection and acceptance of the materials and workmanship to be furnished hereunder, or the failure of such materials and workmanship to comply with the specifications, or to the causes and extent of delays in delivery or erection, shall be determined by the chief engineer of the Commission, or by any officer or deputy to whom the chief engineer may assign that duty, and such decision, when expressed in writing, shall be final.

It has been considered by your committee that the act of June 24, 1914, had the effect of waiving the enforcement of Article X of the original contract against the Contractor.

Article XII of the contract must necessarily be construed in connection with the act of June 24, 1914, and the action of the Isthmian Canal Commission's officers and employees under this provision of the contract viewed in the light of what is equitable, just, and fair.

At the time the supplemental contract quoted above was made it was understood as constituting a final settlement of—

All and any such claims for damages which have heretofore arisen or which may arise out of any delays which have occurred prior to the date of this contract, either on the part of the Contractor or on the part of the Commission, and that the determination of the causes of any delays in completion of any part of the work covered by this contract which may occur after the date hereof and whether the Contractor is entitled to additional time within which to complete any part of the work shall be made in the manner and under the conditions provided in the original contract of June 21, 1910.

The entire subject of delays and the substitution of new dates for those under the original contract was considered by Mr. Henry Goldmark, designing engineer, in a memorandum to Col. Hodges, and recommendation was made as to the amount of time the contractor was entitled to on account of the various claims that he had made for extension of time up to that time. (See p. 213 of Mr. Goldmark's report, vol. 1 of the testimony; see also the testimony of Mr. Goldmark, vol. 8, pp. 203 and 204, and the exhibits therein referred to.)

One of the causes for which additional time was claimed, and which formed a part of the basis of the supplemental contract, was the claim that the Commission failed to supply storage grounds and back fill at the lock sites, and also interfered by trains and other operations with the Contractor's work, and by allowing the lock chambers to become flooded. This claim for these causes, therefore, appears to have been included in the settlement as to delays effected by the supplemental contract. There was not, however, any attempt to determine in detail the damages or extra expenses which the Contractor had been put to by reason of these delays. The consideration moving to the Contractor in making the supplemental contract probably to some extent compensated him for the increased expenses and damages to which he was put on account of the delays and interferences due to lack of proper storage grounds; but whether or not this is so depends largely upon the question as to whether the Contractor was entitled to a greater allowance of time than was finally agreed to in the supplemental contract.

It will be noted that in the supplemental contract the only thing that the Contractor was relieved from, practically, was the provision in the contract for liquidated damages and the extent to which that provision could have been enforced against him in case a supplemental contract had not been entered into and the work had been completed under the original contract.

The Contractor, under the supplemental agreement, became obligated to complete certain of the locks at an earlier date than he would have been required to complete them under the original contract after an allowance of the additional time to which he was entitled to. As to certain other of the locks, if completion had been made under the original contract, he would have been subjected to considerable liquidated damages. If all of the additional time claimed by the Contractor at the time of making the supplemental contract had been allowed, and he had been charged one-tenth of 1 per cent per day on the contract price for failure to complete the gates by the dates arrived at after allowing him all the time that he claimed, he would have been charged \$312,516.50.

It is not admitted, however, that the Contractor would have been entitled to all of the additional time that he claimed, and if only



such time as he was entitled to under the claim made by him had been allowed it is probable that considerably more liquidated damages would have been chargeable against him than shown on page 276 of this report. Under the supplemental contract, certain of the gates that were essential to the use of the canal were completed earlier than their completion could have been required under the original contract. The substance of the agreement, therefore, was that the claimant was relieved of a large sum for liquidated damages that he would have suffered if completion had been made under the terms of the original contract, and that the United States got the use of the completed locks at an earlier date than it could have gotten them under the original contract.

The delays for which additional time was requested prior to the making of the supplemental contract were listed by the Contractor as follows:

DELAYS DUE TO FOLLOWING CAUSES.

1. Drawings and ordering material for water-tight frames.
2. Change in skin of 77-foot leaves.
3. Air-tight pump chamber, pumping system, and mitering devices.
4. Further changes in manhole covers vertical hinge. Grove added for rubber.
5. Delay in approving drawings for 66-foot and 87-foot leaves.
6. Accident to steamship *Dania* in Baltimore.
- 7a. Delay in shop through *Moldegard* loss.
- 7b. Delay in field through *Moldegard* loss.
8. Strike in Wheeling.
9. Stevedores' strike in Baltimore.
10. Condition of tracks, storage yards, and back fill at Gatun.
11. Same as 10 at Pedro Miguel.
12. Same as 10 at Miraflores.
13. Flooding of west chamber at Pedro Miguel.
14. Changing anchorages at Gatun put in inaccurately by Commission.
15. Power breakdown at Rankin.
16. Masonry at Pedro Miguel and Miraflores not ready on contract time.

The delays, exclusive of item 16, are then totaled on the blue print, and the totals for the items making allowance for overlap of individual delays are placed in one column and totals of delays on account of masonry not being ready on contract time are placed in another column. (For complete details as to claim, see blue prints A and B, Exhibit 1, in the testimony of Col. Jervcy, vol. 24. For recommendation on the claim made by Mr. Goldmark in detail, see exhibits marked A and B, Exhibits 141 and 142, vol. 31 of the evidence, Isthmian exhibits.)

On January 27, 1913, Mr. Goldmark made a complete report to Col. Hodges on the claim of the Contractor for delays. (See pp. 213 to 225 of Mr. Goldmark's report, vol. 1 of the evidence.) Col. Hodges made the following report to the chairman and chief engineer on February 25, 1913, which is quoted below:

Inclosed are transmitted the papers in reference to the claim of the McClintic-Marshall Construction Co. for allowance for delay in the execution of the contract for the mitering lock gates. As a consequence of their claim the company now asks, by its president's letter of February 20, that a supplemental contract be entered into, embodying certain new dates of completion, and offering as consideration:

- (1) To use their utmost resources to anticipate these dates of completion.
- (2) To make no charge for the use of their erecting bridges for transferring material to the center walls.



(3 and 4) To do certain work on the Balboa Dock leaves which is not provided for in the contract for these leaves and is, as shown by experience with the lock gates, very desirable.

In addition, by another letter of February 1, 1913, from the chief engineer of the company, the offer is made to turn over to the Government at the conclusion of the contract the tracings which were made for the lock gates and for the Balboa Dock gates.

The items upon which the claim for delay is based are as follows:

(1) Delay in settling upon a design for the manhole covers:

The designs originally prepared by the Commission for the manhole covers were not so good as those which we now have. They would, however, have served their purpose. The suggestions for a change came originally from the New York Shipbuilding Co., supported by the McClintic-Marshall Construction Co., who were to prepare alternative plans and make a proposal to the Commission to make substitution at a reduced rate. The McClintic-Marshall Construction Co. took about two months to prepare the plans. These were altered and modified in the inspector's office in the United States and returned to the Contractors about six weeks later, the original suggestion having been made about July 24, 1910, and the plans given to the Contractor to make his offer on November 1, 1910. It was then found that the new design would cost more than the Commission's design, and accordingly, on November 30, 1910, I directed adherence to the original design, which decision was cabled to the Washington office on December 3, 1910. The McClintic-Marshall Construction Co. urged the adoption of the revised plan, and in agreement with their views certain slight changes, involving the use of a rubber gasket and change in handle details, were made, but the structural frame was retained as per original plan. The company claims 114 days' delay on this item.

I do not doubt the statement that certain plates necessary for all the leaves were not ordered until the approval of these plans was obtained. During this time, however, the Contractors were preparing the shop drawings for the other parts of the gates. Drawings for a number of the parts, which are not affected by the water-tight manhole covers, were submitted for approval for the first time in December, 1910, even after the revised plans for the manhole covers were ready, as, for instance, the intercostals, the end plates, and the bent plates. The shop drawings for the water-tight frames were finally approved in Mr. Hammer's office on December 27, 1910.

The first of the Contractor's shop drawings were approved on November 1, 1910. It is safe to say that drawings for the parts involving the manhole covers would not have been approved before that date, and that, therefore, the utmost delay in this matter which can be chargeable to the Commission would be from November 1, 1910, to the final date of approval of these drawings, namely, December 27, 1910. Mr. Goldmark recommends an allowance of 50 days' delay on this item, covering the entire contract. This, I think, is fair.

(2) The Contractor claims 7 days' delay for change in shop drawings for sheathing plates for the 77-foot leaves.

This change was made in order to make the Contractor's drawings correspond with the general drawings prepared by the Commission. Mr. Hammer recommends no delay and I agree with him.

(3) Change in details of pump chamber.

The Contractors claim 23 days. The pumping system for the gates as originally designed was changed and materially improved after letting the contract. This involved chiefly the shop drawings for the two bottom girders. The Contractors began work on the drawings for the pump chamber according to the original design on October 1 and were notified of the change on October 24, making 23 days' delay in the preparation of these drawings. I do not believe that the entire work was delayed 23 days, by the fact that the detailed drawings of the two lowest girders could not be worked up for that time, but I think that the Contractor's claim would probably stand on the facts as stated.

(4) For delay on account of change of hinges for water-tight frames. This is independent of the claim made in item (1), ante. In view of the experience in the previous attempt to change the manhole covers the change in hinges was not ordered until the Contractor had stated specifically that they would make no claim for delay or extra charge. On that account the claim should not be allowed.

(5) For delay in approval of the drawings for the 66-foot and 82-foot leaves, these being the lower service gates and the lower guard gates at Miraflores.

There was, unquestionably, long delay in approving these drawings. The Contractors claimed, originally, "at least 40 days' delay on this item." In their



claim now submitted they ask 75 days' delay. The Contractor states that the drawings for the 82-foot leaves were submitted for approval at various times between October 1, 1910, and April 28, 1911. Mr. Hammer's report shows that they were approved on March 6 to 18, 1912, and that the mill orders for the structural material were issued on April 20, 1912. For the 66-foot leaves the Contractor reports that the drawings were submitted from September 30, 1910, to April 28, 1911. Mr. Hammer reports that they were approved from April 2 to 9, 1912, with certain small exceptions. The mill orders were issued under date of June 4, 1912.

The delay in the approval of these drawings was occasioned, probably, by the fact that the gates in question, according to the schedule, were the last to be finished, it not being known in Mr. Hammer's office that the Miraflores guard gates would be needed at an early date. While the delay has resulted badly, it should be kept in mind that had the original contract dates been adhered to these gates would not have been needed in advance of the other gates, and the approval of the plans might safely have been kept to the last, although not for so long a time as it was actually held. Also, the delay in approval would have occasioned no embarrassment had not the steel mills been unable to fill the order promptly on account of press of business. I think, however, that we must confess judgment on this claim and allow the amount the Contractors now ask for, namely, 75 days.

(6, 7A, 7B, and 8) The total amount claimed by the Contractor for these items as accumulative delay is 92 days, which covers the delay in the field caused by the loss of material on the steamship *Moldegaard*.

We have a full and complete report from our inspector, showing material lost on the steamer, which sank in November, 1911. According to our records the material for 15 gates was involved. The Contractor claims delay on 20 gates. Replace shipment for all the material was not completed until April 20, 1912, when the last material started from Rankin. On these items combined a delay of 92 days is not excessive.

(10, 11, 12, and 13) Conditions of tracks, storage yards, etc., at Gatun, Pedro Miguel, and Miraflores, and flooding of west chamber of Pedro Miguel Lock.

Letters from Col. Sibert and Mr. Cole recommend allowance, for these various causes, of 30 days at Gatun and 80 days at Pedro Miguel. No figure can be given as yet as to delay at Miraflores. I am not disposed to reckon this in at the present time. There was some interference with the Contractor's work during the completion of the back fill of the upper lock, east wall, at Gatun, and they were cramped for storage space when they first started there. There was more extended interference at Pedro Miguel and time certainly lost by flooding the west chamber. The condition of the back fill was such that an accurate estimate in days could hardly be made at the time. The dates of the floods, however, were carefully recorded, and the delays incident thereto noted at the time. I see no reason to question the judgment of the local engineers, and their figures have been adopted in Mr. Goldmark's tabulation.

(14) Claims of 5 and 10 days' delay at two gates at Gatun are stated to be due to faulty placing of anchorages by the Commission.

I do not think that the Contractor was delayed on this account.

(15) Delay due to breakdown of power plant at Rankin. Seven days' delay is claimed on this score by the Contractors, but it is not counted by them among the accumulative delays. The claim was passed upon at the time by Maj. Boggs and denied.

(16) The Contractor claims long delay at Pedro Miguel and Miraflores, due to the fact that the masonry at these points was not ready on the dates set in the contract. The specifications prepared in this office provided that delays on account of noncompletion of masonry would be allowed only in case such noncompletion should delay the erection of the gates. The contract, however, as drawn in the Washington office, omits the qualification, and apparently, if construed narrowly, would allow a claim for delay if the masonry were not ready at contract time, even though the Contractor's operations were not affected by this unreadiness. I do not think such a claim is reasonable, and the Contractor does not at present press it, the time not being included among the accumulative delays.

It must be acknowledged that the masonry was not ready on the dates stated in the contract for its completion, but it was ready in all cases before the Contractors were prepared to begin operations. As the Contractors claim, and we allow, long delays affecting all the work from the very beginning of



the contract in item (1), we should certainly be entitled to set our dates for completing the masonry forward by this amount, since it affects the remainder of the contract.

Attention is invited to the accompanying memorandum from Mr. Goldmark and especially to his Exhibit A, showing, in tabulated form, the delays which he recommends on the different items. It will be noted from his memorandum of February 21 that the delays which he would allow would still leave the gates at Gatun and Pedro Miguel far in arrears of liquidated damages, but would advance the completion of the gates at Miraflores, and the ultimate completion of the work, somewhat beyond the dates which the Contractor now proposes for the completion of these works.

It would be hard to place a monetary value upon the considerations offered by the Contractors as an offset against the liquidated damages. Under either estimate of the delays to be allowed the Contractor, the original contract dates would be materially advanced. If our estimates of the delays be correct, and if the contractor finish the work on the several gates on the dates now proposed for completion, they will, under the existing contract, suffer a severe loss in liquidated damages at Gatun, Pedro Miguel, and at the upper guard gates at Miraflores, but will finish the remaining work at Miraflores and the entire contract ahead of time. If the Contractor's claim for delay be correct, and they finish as now proposed, they will lose in liquidated damages certain small sums on the upper guard gates at Gatun and on the Pedro Miguel work, but will be far ahead of time on the remainder of the work.

It was understood by the Contractors early in the work that if they finished the whole contract within the date set for completion, which would, of course, be advanced by the amount of any allowable delay, they would not suffer in liquidated damages on account of not complying with the intermediate dates.

It would be possible to urge as an offset against the delay occasioned by the Government the fact that we remitted to the Contractor the erection in the shops of much of the work which they would have had to erect there under the contract. It would be difficult to prove, however, how far this remission of shop erection advanced the erection of the work in the field.

The contract as now drawn does not permit relieving the Contractor of liquidated damages for delays, simply because the latter have not affected the Commission injuriously. It gives allowance for delays due to strikes, acts of God, or public enemies to the extent to which the same, in the judgment of the Commission, may be justified, and increases the period of erection of the different parts of the work by the amount of any delay which may be caused by the Commission.

The total amount of liquidated damages which the Contractor would have to pay under the original contract would probably be ruinous to them. They are unquestionably entitled to some delay, and the estimate given by Mr. Goldmark in Appendix A appears to me to be reasonable. They probably can not now complete the gates at dates earlier than those stated. To insist upon the earlier dates for Gatun and Pedro Miguel, given by our own estimate of the allowable delays, would not hasten the ultimate completion of the work. I recommend, therefore, the adoption of the dates proposed by the Contractor and the preparation of a supplemental agreement embodying these dates and the considerations which the contractors offer as an offset, also the changed clause as to liquidated damages. It would be well to include in this supplemental agreement a clause providing for an increase in liquidated damages in case the contractors fail to complete the entire work at the time stated.

It will undoubtedly be necessary to submit this supplemental agreement to the accounting officers of the Treasury prior to its execution.

(See pp. 224 to 232 of Mr. Goldmark's report, vol. 1 of the evidence.)

It is clearly shown from these reports and the supplemental contract that the Contractor did not make any claim for additional time on account of the delays that were caused to him by reason of the severity of the inspection, nor for additional time to cover the delays that resulted from punching the holes smaller than required in the original specifications. If claims for these delays had been made, it is probable that the additional time to which the Contractor would have been entitled would have relieved him from a considerable portion of liquidated damages and would have given him such addi-



tional time for completion of the work as would have placed the ultimate completion beyond the dates agreed upon in the supplemental contract.

The provision in the contract referred to by Col. Hodges, under No. 16 of the above report, relative to the masonry, is as follows:

\* \* \* and it is also understood, covenanted, and agreed that the failure of the Commission to furnish any material or service when the Contractor may be ready for the same, or its failure to have any of the foundations ready on the dates specified therefor, shall not make the Commission liable to any claim for damages on that account, but the time within which any gate and fixed parts for same are to be completed shall be extended an equivalent period of time to compensate for such delay.

It is probable that under this provision of the contract the claimant would have been entitled to additional time equal to the period from the date the contract specified the foundations would be ready to the date they were ready, regardless of whether any actual delay was caused thereby or not. The time would have to be granted in order to avoid the payment of damages that might result from this delay.

Under this supplemental contract no specific claim was made by the Contractor for the additional expense and damage that he suffered by reason of interference with the work by the Commission's inspectors. He did not claim any additional time for delays that may have resulted from punching the holes smaller than required in the original contract or to cover unusual demands that may have been made by the inspectors of the Isthmian Canal Commission. Claims for damages and increased expenses incurred by reason of these causes were not specifically considered in this supplemental contract. On the other hand, it is also true that the damages to the Commission due to the dilatory methods of the Contractor and his interference with the work of the Commission, and his use of facilities in excess of those contemplated in the contract, were not specifically considered and adjudicated. Later on in this report, in attempting to fix the responsibility for excess expenditures, these two elements, as they affected the expenditures under the contract, will be considered.

The Contractor claims for delays, owing to condition of tracks, storage yards, and back fills at Gatun, 50 days on the two upper guard gates, 54-foot 8-inch leaves; 60 days on the two upper gates, 77-foot leaves; and 75 days each on all of the other leaves. He claimed at Pedro Miguel 40 days on the two upper guard gates, 54-foot 8-inch leaves; 60 days on the two upper gates, 79-foot leaves; 80 days on the two middle gates, 79-foot leaves; and 100 days each on all of the other leaves. He claimed at Miraflores 11 days' delay on all leaves.

Mr. Goldmark, in passing upon the claim for delays, recommended an allowance of 30 days on all leaves except the two middle gates, lower lock; two lower gates, lower lock; two lower guard gates, lower lock. He recommended an allowance of 50 days for all locks at Pedro Miguel, but made no recommendation for any allowance at Miraflores. (See Isthmian Exhibit No. 141, in vol. 31 of the testimony.)

In his testimony, volume 8, pages 83 to 100, inclusive, Mr. Goldmark gives his recollection as to what storage grounds the Contractor had and how they were interfered with at the various locks by not having sufficient storage yards. In his testimony he states that he



does not think that the 30 days' extension of time allowed at Gatun was sufficient. (See pp. 83 and 84 of this testimony.) He also states, page 86, in relation to the allowance at Gatun and at Pedro Miguel, that—

I did not think at that time, and do not think now, that these allowances were sufficient to cover the delays caused by the failure to provide suitable storage yards and tracks, although, as I stated in my report, it is extremely difficult to estimate the exact amount. In my report I made no recommendation.

Mr. Goldmark's attention was called to his statement in his report, page 31, in which he describes the storage yards that Mr. Jewel had agreed would be sufficient, and states that—

It was intended to use the space available for storage, although in case the available space did not suffice the storage yards provided elsewhere were available, and, in fact, at Gatun about 100 girders were for a long time stored at a lower level near the machine shops on the east side of the middle and lower locks. They were brought up to the upper lock when needed by switching engines furnished by the Commission.

The use of the back fill as storage ground saved the Commission a large amount of money, as the Contractors handled almost all material by their self-propelling cranes, and required only a very small amount of switching to be furnished by the Commission. The method was, of course, a great advantage to the Contractor in saving time and rehandling.

Col. Jervey gives his recollection as to the condition of the storage yards and grounds at Gatun in his testimony, volume 24, pages 2 to 16, inclusive. On pages 2 and 3 he makes the following general statement:

As I recall it, nothing had been done on the storage ground opposite the middle or lower lock, that opposite the upper lock, where the construction work on the gates began, was only partially completed, and there was considerable trouble, inconvenience, and more or less delay, as I recall it, in getting the first shipment unloaded. There were, to the best of my recollection, certain modifications made in this ground, either on a verbal agreement or on a written agreement, I can not state which. For instance, instead of having a double track along here [indicating], as shown on the blue print, I think that there is but one line of track, and certain additional tracks were provided either in the shape of short spurs or coming out from the longitudinal running track, and the Contractor was also permitted later on at least to use a track which was constructed for the towing locomotives on the side wall, and I think also at times on the middle wall of the upper lock. What the actual delay amounted to it would be very hard for me to judge. I had talked about that with the representatives of the lock-gate force, both with Mr. Goldmark and Mr. Guynn, and I gathered from Mr. Guynn particularly that the construction of the upper gates was considerably delayed by the fact that the storage grounds opposite the upper lock were not entirely ready at the time of the arrival of the first shipment of construction plant and material. So far as the other locks were concerned—that is, the middle and lower lock—as I recall it, the yards were ready either before or at the time when needed for the receipt of material and plant for those locks. There is one thing which, of course, was unavoidable where construction was being carried on by three separate and more or less independent organizations—the masonry work and the setting of the fixed steel in the contract was being done under my immediate supervision; the gate erection was being carried on by another department, of which Mr. Henry Goldmark was the immediate representative, and of which Col. (now Gen.) H. F. Hodges was the head. In addition the installation of the machinery was also being officially carried on under Mr. Edward Schildhauer, who also reported to Gen. Hodges. These three departments were all making more or less use of at least part of the various tracks alongside of the lock, and as a result there was at times interference. I do not recall now any written complaint as to this, but where there was such interference it was usually straightened out verbally by the representatives of the several departments on the ground. Due to the heavy rains at Gatun it was, of course, difficult to keep up the tracks



which were subjected to such heavy traffic, and as a result there were at times delays due to derailments, but I would not regard such delays as exceptionally large or more than should be expected on a construction job. As a matter of fact, I think for construction tracks those connected with the lock work at Gatun were kept in very fair shape.

Col. Jervey states that there was some interference by the dirt trains of the Commission using the track, but does not know whether there was a written complaint about it or not.

In relation to the contention of the Contractor that he was required to unload his cars with undue haste, Col. Jervey states (see pp. 5 and 6 of this testimony) :

So far as the material assigned to me was concerned, there was always great urgency in getting the cars unloaded. The Atlantic division was several times reported to the chairman for holding cars. This applied, as I recall it, more frequently to box cars than to flat cars, but I do remember occasions when the Atlantic division was also reported for holding flat cars. When a loaded vessel came in there was usually a roundup over the entire Isthmus in order to get all available cars, and those which had been held under load for even a short time were usually reported as being held loaded. I think that the chief engineer issued several circulars calling attention to the necessity of promptly unloading cars, so I presume that these notices went to the McClintic-Marshall Construction Co. as well as to the various divisions engineers. I can not, though, give any direct testimony as to whether the McClintic-Marshall Construction Co. found it necessary to use undue haste in unloading the cars.

In connection with the reason as to why the lower gates were erected at Gatun with the mitre ends pointing south instead of north, Col. Jervey states (see pp. 6 and 7 of his testimony) :

As I recall it, this method of erection was determined upon by Mr. Jewell, who was then representative of the McClintic-Marshall Co. on the Isthmus, in order that the lower operating gates and the lower guard gates might be erected without changing the position of the Contractor's construction bridge. I am positive that Mr. Jewell made the original suggestion for this method of erection. The reasons for this suggestion I should say were two—first, the advantage of erecting two sets of gates with a bridge in one position, which would be an advantage from the Contractor's standpoint, and the advantage from the standpoint of the Atlantic division of only one spur track leading into the construction bridge. It is also probable that the question of the danger of the tracks laid to the construction bridge sliding into the excavation at the north end of the locks was considered. I do not, however, definitely now recall any conference with Mr. Jewell on that particular point. There was undoubtedly some additional expense involved to the Contractor in moving the guard gates to their proper position after their erection. This would have been partially compensated for by the fact that both guard gates and operating gates were erected from one position of the construction bridge and that the erection of the two sets of gates could go on simultaneously.

In regard to whether it was originally contemplated to use the large, level plateau on the west side of the Gatun Locks for the general storage yards, Col. Jervey states (see p. 8 of his testimony) :

Yes; it is a fact that it was originally contemplated to use a large, level plateau on the west side of the Gatun Locks for the general storage ground. A large amount of the excavation from the locks was dumped at this locality in order to form the site for the storage ground, and several miles of track with a number of spurs were laid on this area. It was used as a storage ground by myself for storing the fixed steel connected with the locks and was later used as a storage ground by the first division, which reported to Col. Hodges, for various items pertaining to the lock-operating machinery. That ground in whole or at least in part would have been available or could have been made available for storage for gate material if it had been desired for that purpose.

On page 12 of his testimony Col. Jervey states, in relation to the amount of time that should have been allowed at Gatun to cover de-

lays due to the fact that proper storage grounds had not been furnished, that—

I thought at the time, as well as I recall it, that three or four months was probably the measure of contract time that should be allowed.

The brief of the testimony made by the Contractor in relation to whether or not proper storage grounds were furnished at Gatun, Pedro Miguel, and Miraflores is substantially correct, and the testimony referred to therein substantiates the claim of the Contractor that sufficient storage grounds were not furnished at Gatun, Pedro Miguel, or Miraflores. The correspondence dealing with the subject of the storage grounds furnished at Miraflores is found in exhibits 48 to 70, inclusive, of the Isthmian testimony, volume 31. From this correspondence it appears that the contractor complained that the back fill which was to be used as a storage ground was not sufficient to accommodate one full cargo of steel and insisted that there should be storage grounds sufficient for from 7,000 to 10,000 tons of material on the upper level. (See letter of Mr. Jewel to the chairman and chief engineer dated Jan. 12, 1912, Exhibit No. 52.) It also appears from a letter from Mr. McClintic, dated January 24, 1912, Exhibit No. 53 in the exhibits above referred to, that he had instructed the shop as follows:

Do not ship any material for Miraflores until after further advised, as the fill at Miraflores is not in shape for receiving it.

On February 3, 1912, Mr. Jewel wrote to Mr. Goldmark that—

Our work has been considerably delayed, and we have been put to a great deal of extra expense on account of having material delivered, both at Gatun and Pedro Miguel, before the storage yards were in proper shape for sorting this material, and consequently it had to be unloaded in promiscuous piles without regard to order.

We must insist that every effort be made to avoid this condition at Miraflores. This will require the back fill to be extended the full length of the upper chamber on the east side, so that material can be unloaded in a systematic way.

Again, on February 13, 1912, he wrote Mr. Goldmark, calling his attention to the fact that he had received notice that the first four 77-foot leaves for Miraflores would be shipped not later than March 1 and urged him to have the back fill completed for the full length of the chamber ready to receive the material.

The correspondence referred to contains numerous protests that the fill was too narrow, urging that it be increased in width.

On June 1, 1912, Mr. Jewel wrote to Mr. Goldmark, stating, among other things, that—

We can delay starting the work at Miraflores not later than Monday, June 10, and we must request that this storage space outlined above be completed to the limits mentioned at that time.

The storage space referred to in this quotation was as follows:

Referring to storage yard at Miraflores: When you, Mr. Williamson, and the writer looked this ground over some time ago it was agreed that the yard with two parallel tracks, 25 feet center to center, and a storage space 70 feet wide on each side of this pair of tracks should be completed for a distance of 1,000 feet on the upper level by May 21. This much space is the minimum to allow the proper storage of the material for the first gates at Miraflores, but is not yet completed.

On June 11, 1912, Mr. Goldmark wrote to Mr. Jewel:

Replying to your letter of June 1 with regard to storage yard at Miraflores, I looked over this yard on June 4 and it seems to me that the ground is now



ready for your use for any purpose that you can put it to in the immediate future. The ground has been graded for two tracks and beyond two tracks for a distance of about 40 feet with a total width of about 215 feet from the edge of the lock wall. This full width extends to a point about opposite the middle gate and far above the upper guard gate. The filling is going on as rapidly as possible below the middle gate and only a small, narrow triangle remains unfilled between the back of the side wall and the high level. There are also some other tracks on this level which could probably be used for placing material. An estimate made by Mr. Mathews and myself would indicate that several hundred girders could be placed easily on the ground now available, besides ample room for plates and smaller parts.

I do not see, therefore, any reason for anticipating trouble with reference to unloading material at this point.

In his letter of June 1, 1912, to Mr. Goldmark, Mr. Jewel states:

We anticipate delivering the first erection bridge at Miraflores about July 1. Considerable material for Miraflores is now on the Isthmus unloaded at Gatun and Pedro Miguel, ready to reship as quickly as the back fill is in condition to receive it.

Replying to the letter of June 11, 1912, from Mr. Goldmark, quoted above, Mr. Jewel states:

I am in receipt of your letter of June 11, in regard to storage facilities at Miraflores.

As stated to you and Mr. Williamson personally, on the ground, when it was agreed that 1,000 feet of this storage yard with two tracks through the center, graded 65 to 70 feet on each side outside of the tracks, would be ready on May 19, this is the minimum amount of space which will allow us to begin operations at Miraflores.

As stated to you verbally, more than once, our operations both at Gatun and Pedro Miguel, have been seriously handicapped on account of insufficient storage space, as well as back filling and other operations going on in the storage yard at the same time as the lock-gate erection. Practically all girders for the upper guard gates at Miraflores have been unloaded at Gatun and Pedro Miguel, where they are still stored on account of the unfinished condition of the Miraflores work.

It is possible to pile a great mass of material in a small space, but it is not possible to make any progress on erection unless such material is distributed so that it can be secured approximately in the order wanted for erection. In order to do this we must have 1,000 feet of yard room with two tracks and space on each side as outlined above, and failure on your part to provide this means delay to our work.

We now have a crane at Miraflores and will load and ship all material for the work there which has been unloaded at other places as quickly as storage yard is provided as outlined above. We will be ready to begin erection operations at the upper end of the upper level by the end of the present month, and at the lower end of the upper level by the latter part of August at the outside. (See Exhibit No. 64, vol. No. 31.)

On July 26, 1912, Mr. Jewel wrote Mr. Goldmark as follows:

On July 25 about 800 feet in length of two parallel tracks were turned over to us by the Pacific Division for storage.

Mr. Clark advises me that this is all the space which will be available to us for the next two or three weeks.

At a conference between you, Mr. Williamson, and the writer at Miraflores early in the year it was pointed out that a 1,000-foot length of track with 60 to 70 feet of storage space on each side would be the minimum amount of space which would answer our purpose and enable us to handle material and get the erection started at Miraflores without loss of time and extra expense in handling material. Mr. Williamson promised this much available space four months from the time of our conference, which would make it May 21.

On July 25 the fill was extended for a total length of about 450 feet on the side next to the lock wall. From this point the fill drops away from the lock wall, intersecting the storage tracks as shown approximately on the attached. On the outside of the two storage tracks, that is, the side away from the lock chambers, the width of a fill promised is obtained for a distance of a few hundred feet at the lower or south end of the fill.

We have already handled a great deal of material for Miraflores twice. This material contains about 350 sheathing plates which have been stacked up at Miraflores for some time awaiting available space for sorting and storing in the proper way. We expect to start the erection with our first set of bridges at the north end of the Miraflores Locks next week, but have not yet delivered all material necessary to complete the first set of four leaves which this bridge will erect.

I am calling your attention to the condition of the track at Miraflores as a matter of record, and would like for you to visit this point with me next week when convenient, when I can show you on the ground just how our operations are handicapped and made more expensive on account of the conditions under which the work there must be carried on. (See Exhibit No. 66, Isthmian exhibits, vol. No. 31.)

Just what reply was made to this letter does not appear in the testimony.

On August 16, 1912, Mr. Jewel wrote the McClintic-Marshall Construction Co. that—

We are up to the masonry work in erection at Miraflores and are handicapped by unfinished back fill both there and at Gatun.

Other correspondence in connection with the storage yards and tracks at Gatun and Miraflores, in the exhibits above referred to, supports the contention of the Contractor that he was not furnished with sufficient, suitable, and unoccupied storage yards and tracks at either Gatun, Pedro Miguel, or Miraflores.

The claim of the Contractor on page 39 of the claim, that—

The Commission failed to furnish, in accordance with the terms of the contract, sufficient, suitable, and unoccupied storage grounds on the Isthmus for the material of the Contractor—

is established.

The Contractor does not give any basis upon which he arrives at the amount to be deducted for the condition of yards and tracks in establishing his normal for Miraflores. (See p. 75 of the claim and p. 253 of this report.) If the normal arrived at by taking Mr. Mitchell's estimate and increasing it, as shown on pages 265, 266, and 267 of this report, is to be taken as the final basis for the examination of the claim, the total excess for labor and general expenses will be \$943,612. This is equal to 77.4 per cent of the claim of the Contractor for these items as finally revised. (See p. 254 of this report.) Seventy-seven and four-tenths per cent of the amount deducted for condition of yards and tracks—\$6,753—would equal \$5,226 as the amount to be deducted as excess labor for condition of yards and tracks in establishing a normal, as shown on page 75, of the Contractor's claim. To this should be added \$747 to cover the excess of transportation, liability, and general expenses, treating the claim as a whole, as explained on page 267 of this report. By this method the amount of the claim at Miraflores for condition of yards and tracks was \$5,973.81. This would make the total amount claimed on this account, under the way in which the claim is stated, approximately \$19,546.

The total contract price of the leaves at the various lock sites was as follows:

Gatun, 40 leaves (Nos. 1 to 40, inclusive) -----	\$2, 421, 174. 29
Pedro Miguel, 24 leaves (Nos. 50 to 73, inclusive) -----	1, 419, 009. 75
Miraflores, 28 leaves (Nos. 100 to 127, inclusive) -----	1, 690, 323. 14
Total -----	5, 530, 507. 18



The average price per leaf at the different lock sites was as follows:

Gatun -----	\$60, 529. 35
Pedro Miguel -----	59, 125. 40
Miraflores -----	60, 368. 68

The liquidated damages per day, in accordance with the terms of the original contract, on the entire 40 leaves at Gatun would have been \$2,421. On all the leaves at Pedro Miguel it would have been \$1,419 per day, and on all the leaves at Miraflores it would have been \$1,690 per day. On individual leaves at Gatun, if it could have been computed that way, it would have been about \$60 per day, and at Pedro Miguel it would have been about \$59 per day; at Miraflores, about \$60 per day.

The Contractor was paid one-half the value of the material before it was delivered at the lock sites. If we should assume that the damages to the Contractor for delays caused by the Government were as great as the liquidated damages which the Contractor agreed to pay for delays, basing the rate on the unpaid portion of the contract price, the damages to the Contractor per leaf would have been about \$30 per day.

The delay at Miraflores that was claimed was claimed on all of the leaves.  $\$30 \times 28$ , the number of leaves, would make \$840 per day. At this rate the damages to the Contractor for the delays at Miraflores would have been \$9,240.

The total amount paid for labor, transportation, liability, and general expenses was \$3,561,898. The period of erection covered about 990 working days. This would make the daily average expenditure at all locks nearly \$4,000. Of course, in the beginning of the work there was but a very small per cent of the average expenditure per day. The condition of the storage yards at Gatun, however, continued for a considerable period of time—some five or six months. It continued for a considerable time, also, at Pedro Miguel, much longer than the actual number of days allowed for the delays. The interruptions and interferences at Miraflores extended over a considerably longer period than 11 days of the additional time which was claimed. It also appears that a considerable amount of material for Miraflores had to be unloaded at Gatun and subsequently loaded and shipped to Miraflores, also some of the material had to be handled a second time on account of the fact that it could not be properly stored when unloaded at Miraflores.

These damages are impossible of definite ascertainment by any method of computation or the application of any exact figures to known conditions. The best that can be done, therefore, is to make a reasonable estimate as to what would appear to be a fair, just, and equitable amount to be paid to the Contractor on account of the failure to furnish sufficient, suitable unoccupied storage grounds.

The amount of the claim when reduced to correspond with the normal cost as shown on page 267 of this report seems to be reasonable and fair. The allowance on this specific item in the claim would amount to about \$20,000.

Taking into consideration the fact that the delays, interruptions, and extra expenses on account of not having sufficient suitable storage grounds at Gatun and Pedro Miguel were much greater than at Mira-

flores, the deduction from the actual expenses at Miraflores in arriving at a normal would be authorized, and the allowance that would result from such reduction in the actual expenses to arrive at a normal is considered reasonable.

The above computations have been inserted merely to show the reasonableness of the claim.

The second paragraph of the third claim in support of claim 6, page 39 of the book of claims, reads as follows:

That the Commission obstructed the erection by its failure to keep water out of the lock chambers and in other ways.

The money value placed on this claim by way of deduction from the actual expenses at Miraflores to establish a normal is as follows:

(d) Water in lock chambers, \$5,000.

(See p. 75 of the Contractor's claim; for Contractor's reference to the testimony in support of this claim see his brief, pp. 102 to 104, inclusive.)

Mr. Goldmark's recollection as to what took place in connection with the flooding of the lock chambers is given on pages 40 to 45, inclusive, of his report. This is a short and rather complete statement of the main facts, subsequently supported by the testimony of witnesses, and is quoted in full below:

#### FLOODING OF LOCK CHAMBERS.

The contract and specifications contained no reference to the flooding of the locks, nor to any obligation upon the Commission to keep the locks free from water. The contract does, however, provide that the Commission shall furnish suitable foundations, and it was subsequently held (see letter of Col. Hodges to the chairman of Nov. 8, 1911, file 84-C-81, Pt. VI) that this called for suitable foundations free from water, and that it was the duty of the Commission to free the sumps and lock sills, as well as the locks, from such water as might come in from time to time. It may be added that it was necessary, in order to carry on the work done by the Commission directly, that in most places the water should be removed, and pumps were installed for this purpose.

At Gatun there was never any trouble or complaint from the contractors of sumps not being pumped out as needed, and the water never rose above the sills. At Pedro Miguel there was very serious flooding, as the Pedro Miguel River at times of great rainfall backed up into the locks for a period of several days at a time. Furthermore, the entire drainage from Culebra Cut was carried through the culvert in the middle wall at Pedro Miguel, and on one or two occasions the wooden flume connecting this culvert with the tail bay of the west lock broke, flooding this chamber.

The first complaint was contained in a letter from Mr. Jewel to Henry Goldmark dated October 21, 1911 (file 84-C-81, Pt. VI), complaining of the rain filling the sumps in the east chamber so that it ran over the gate sills. This complaint was referred to Col. Hodges by myself in letter of October 23, 1911, and by Col. Hodges to the chairman by memorandum of October 23, 1911, resulting in a letter from the chairman to Mr. Watt, acting division engineer, dated October 23, 1911, instructing him to keep the sumps clear of water. On November 4, 1911 (same file), Mr. Williamson requested further instructions, claiming that it was the Contractor's business to keep the sumps free from water after they had once been pumped out.

This letter of Mr. Williamson was commented upon by myself November 8, 1911, in a memorandum to Col. Hodges, and also in a memorandum from Col. Hodges to the chairman of the same date, in which the Commission's obligation to keep water out of the locks was pointed out.

This interpretation of the contract was apparently approved by the chairman. At any rate, from that time on it was understood that the Commission was to keep the water out of the locks, and steps were taken to remove the water at different times as it accumulated.



Although no radical means were adopted to keep out the flood water at Pedro Miguel until a later period, as a matter of fact there were numerous complaints from the Contractor as to further floods in the Pedro Miguel Locks. They are summarized in a report from Mr. Matthews, inspector for the Commission, dated December 30, 1912. (See memorandum of Henry Goldmark to Col. Hodges of May 10, 1913, file 84-C-81, Pt. XII.) According to this memorandum there were, during 1912, nine separate floods which interfered more or less with the Contractor's work. These floods were made the basis of a claim by the Contractors in connection with their claims for delays in January of 1913. (See letter of myself to Col. Hodges of Jan. 27, 1913, and of Col. Hodges to the chairman of Feb. 25, 1913, file 84-C-81, Pt. XI.) The statement of these floods agrees quite closely with those listed in the Contractor's "claims" on page 45, although, as a matter of fact, our records show one or two floods not mentioned by the Contractor.

In January, 1913, in recommending a revision in the dates of delivery, Col. Hodges recommended that 30 days' extension be given to the Contractors for delays from floods at Pedro Miguel up to that time, this being in accordance with the recommendations of myself. I have always thought that this was a very moderate allowance for so many interruptions. Although in many cases it was possible to transfer the men who were hindered from working by the floods to some other part, this was not always the case, and there is no doubt whatsoever that the program of the Contractor's erection force was seriously interfered with by these floods.

As a matter of fact, there was not the slightest excuse for not having prevented the entrance of water into the lock chambers. A simple dam about 10 or 12 feet high at the lower end, such as was finally built, would have been ample to keep out every drop of water. This was opposed by the division engineer and was built rather late in the day, but even then in such manner that it did not remain in perfect condition very long. I have always felt, and I think Col. Hodges did, that the interference with this work by floods from the Pedro Miguel River was one that could have been foreseen perfectly, and that it was a mere piece of good fortune that, owing to an extremely dry season, we did not have exactly the same trouble in 1911 as we did in 1912.

Subsequent to January, 1913, there was, I believe, no further trouble at Pedro Miguel until October 16, 1913. (See letter of Guynn to Henry Goldmark, file 84-C-81, Pt. XIV.) This date Mr. Guynn wrote me that the pumps were broken down in the west lock at Pedro Miguel so that the sumps were filling, interfering with the work on leaf 65. I do not find any further reference to this flood, and it is not mentioned in the Contractor's "claims."

In lower Miraflores Lock there was serious trouble from water, but these floods coming later were, of course, not mentioned in the delays claimed by the Contractor in January, 1913. They are given in some detail in the correspondence subsequent to that date, list of which is appended to this report. The records agree quite closely with the Contractor's record on page 46.

The first flood of June 15 appears to have been due to leaving an emergency orifice open in the dam, allowing the water to enter the chambers. Our inspector recommended allowing two days' delay for this flood. It is commented upon by Mr. Cole in a memorandum of June 21, who also recommends two days' extension of time. There are further reference to this flood in letters of Mr. Sterrett to the writer, dated June 27, inclosing a report of his superintendent, Mr. Wright; a letter of myself to Mr. Guynn dated June 27; also a letter of Inspector Howe to Mr. Guynn dated June 29, and letter of Mr. Guynn to myself dated June 30, in which he recommends an allowance of three days; a letter from Col. Hodges to Childers, general superintendent, dated July 2, 1913, in which he concurs with the allowance of three days; and finally a letter from Mr. Childers to Col. Hodges of the same date, in which he says that this allowance of three days will be satisfactory to them. (All in file 84-C-81, Pt. XIII.)

The reference in the Contractor's "claims" to a flood on June 27 seems to be an error arising from some of the letters regarding the last flood being dated June 27.

The next and most important flood at Miraflores occurred on August 31, and covered about the period claimed by the Contractor, namely, August 31 to September 8 for the west chamber, and August 31 to September 17 in the east chamber. This flood was due to a leakage in one of the valves subsequent to blowing up the dike below the Miraflores Lock. The water rose to 13 feet in the west chamber and to about 4 feet in the east chamber. It proved very



difficult to pump out this water in both locks and to close the opening through which it came in. It interfered very seriously with the work in both chambers, flooding some of the air chambers, requiring extra cleaning out of the air chambers in several of the gates, injuring some of their tools, and delaying work on all the gates in the lower lock. I do not think it has ever been made the subject of a specific claim, as the gates were finished shortly thereafter. At the present time the contractors claim a loss of \$5,000 due to water in the lock chambers. At that time they were employing about 1,200 men at Miraflores. I do not think that many of these were paid when no work was going on, but the actual loss to the Contractor from stopping work when it was being rushed at high speed was undoubtedly serious. The charge of \$5,000 for this delay does not appear unreasonable.

#### SHORTAGE OF WATER SUPPLY.

The Contractor claims that the water supply was insufficient for his air compressors and other purposes on several occasions at Pedro Miguel, and also at Miraflores, as well as on one occasion at Gatun.

The Commission was obliged to furnish this water free of charge, according to Specifications Circular 576, section 11.

With the exception of the shortage claimed on October 7, 1912, at Miraflores, I find that all the other dates given agree with our records. In each case mentioned the shortage was verified by reports from our own inspectors, and instructions were given to remedy the same. Reference is made to list of letters appended to this report, which gives details regarding each occasion on which the water was insufficient for the Contractor's needs.

In a memorandum to Col. Hodges, dated January 27, 1913, reporting on the delays in lock-gate erection, Mr. Goldmark states:

As to No. 13, the flooding of the west chamber at Pedro Miguel, the report of Inspector Matthews, attached hereto, is to the effect that there were nine floods during this season; and although on each occasion it proved possible to change the order of erection in such a way as not to keep the men idle for extended periods of time, there is no doubt in my mind that the resulting delays in the prosecution of the work were in each case quite considerable. The interference with the orderly progress in work of this kind is an important matter. The claim of 30 days for nine distinct floods can not be considered excessive. (See p. 218, vol. 1, of testimony.)

The report of Inspector Matthews, referred to by Mr. Goldmark in the above-quoted statement, was as follows:

First flood: May 13, 1912, west chamber flooded 2 feet over sills. Water pumped out, leaving sills dry, May 14, 1912. Half colored help sent home all of May 13, 1912.

Second flood: July 17, 1912, west chamber flooded 3 feet over sills. Operations resumed in full July 18. July 22 water below sill.

Third flood: July 31, 1912, west chamber flooded 2 feet over sill, causing delay to crane. Dismantled erection bridge. Otherwise all men at work on gates. August 2 water below sills.

Fourth flood: August 19, 1912, west chamber 18 inches over sills. Men transferred to work in east chamber. August 26 water below sills. Crane removed.

Fifth flood: September 17, 1912, west chamber flooded 18 inches over sills and remained flooded until September 26. All men remained at work during same.

Sixth flood: September 27, 1912, east and west chambers flooded 7 feet over sills. Fifty colored men sent home for day; no white men. Full force resumed work following day. October 3 water below sills in east chamber; October 7 water below sills in west chamber.

Seventh flood: October 8, 1912, west chamber flooded 14 inches over sills. All men at work. October 10 water below sills.

Eighth flood: October 23, 1912, east and west chambers flooded to extent of 6 feet over sills. All work suspended on lower guard gates, but all men placed at work on other gates. Contractor's crane submerged and out of commission. October 26 water in west chamber below sills; October 30 water in east chamber below sills. Contractor's crane still remained in chamber and unable to



work, due to tracks being in poor condition. November 5 tracks repaired and Contractor's crane resumed work.

Ninth flood: November 12, 1912, east and west chambers flooded 7 feet over sills. Contractors suspended operations half day. November 14 water below sills in west chamber. November 15 water below sills in east chamber. All men remained at work during flood, with exception noted above.

November 26, 1912, Commission's 24-inch water main broke. All tool men sent home for half day. Operations resumed fully November 27. (See file 84-C-81, Pt. XII, chairman's office, Apr. 1 to May 31, 1913.)

In reporting upon the claim, Col. Hodges states that:

The lock chambers at Pedro Miguel and Miraflores were flooded on certain occasions, and doubtless the Contractor's work on certain gates was somewhat delayed. My recollection of the circumstances and the report which we have on file from our inspectors indicate that the delays were not important and that during them the Contractor's force could have worked elsewhere, although possibly to some disadvantage. Under the contract, Article II, last paragraph on page 5, such delays are proper causes for extension of time, but are explicitly excluded as grounds for damages. They were advanced and considered as reasons for extension of time when the contract was modified by that of May 20, 1913. (See pp. 5 and 6, Exhibit 33-A, vol. 33-A, of the evidence.)

Mr. Guynn stated, in relation to this feature of the claim, that (see p. 169, vol. 32 of the testimony):

Well, we did have water in the Pedro Miguel and Miraflores Locks on a number of times, but as to the dates I am unable to say. Up to the time I went away, the first part of February, I could have given the number of days, but now \* \* \*. When we had heavy rains the water would back up into the chamber, and it would interfere with the erection.

In reply to the question as to whether he considered it unavoidable, Mr. Guynn stated:

Well, that is sort of a hard question. I hardly know how to answer. Of course, they could have prevented it, but at considerable cost and trouble. They tried to prevent it with sand bags, but were unsuccessful in this.

He was asked if it was due to unusual and heavy rains, and replied:

Yes, sir; heavy rains; and there was considerable water that would drain into the bottom at Pedro Miguel from what is now Miraflores Lake. We also had the same trouble at Miraflores.

Q. The Commission's work was interfered with and the cost increased, as well?—A. Yes, sir. I would have thought so if I had been paying it out at that time.

Mr. Walker, superintendent of construction for the Commission, stated that the lock chambers at Miraflores were flooded several times and that such floods were detrimental to the Commission's work as well as to the Contractor's.

When asked as to what they were due to, he stated (see p. 145, vol. 32 of testimony):

It was due to the long excavation area we had there and the fact that the sump pumps were back in the middle of the lock chamber; they could not be gotten in place. The lowest place we had to pump from was about 100 feet from the upper guard gates, and heavy rains flooded us several times. It was that way continuous all the way out.

Asked if this condition was unavoidable, he stated:

I do not see how it could have been helped without a great deal of extra expense.

He stated this condition caused increased expense to the Commission.

Mr. Wright, foreman of the contractor at Pedro Miguel for a part of the work, stated that he was interfered with by water backing

into the chamber. Asked if he knew to what extent, he stated (see vol. 32 of testimony):

No, sir; but we knocked off there several different days because water was going over the sandbags and flooding us out. We could work on the top leaves, but not from the ground up.

Q. Did it tie up your tools?—A. Yes; everything on the bottom.

He does not know the extent to which they were held up.

Mr. Wright was asked:

Q. Do you remember, Mr. Wright, how much the water flooding in at Miraflores bothered you?—A. I remember it came in there and stayed for over a week at one time. We were bothered more in the west than in the east chamber. That was the date the dike was blown up; in the evening the water commenced coming in.

Mr. Wright was asked to look at the claim at the top of page 46, showing the various dates in June when there was water in the chamber. He stated:

A. I know there was water in there, but the dates I do not remember.

Q. The one next to the last (13 feet in west chamber) you will remember.—

A. I will remember that as long as I live.

Q. August 31 to September 17, 1913, east chamber flooded. Were you delayed much at Miraflores on account of being short an electric crane?—A. I was delayed some; not a great deal.

Q. You can't tell to what extent?—A. No, sir.

Q. At times you complained of being short of water?—A. We would have to shut down. I have shut down a half day at a time a good many times, but I turned all those records in and can't remember the dates.

Q. In that record of water flooding into your chambers, can you say to what extent your work was delayed or what expense you were put to?—A. I had a big gang working at the lower end and the water came in and shut me down entirely; had to lay some of them off and switch them around to the upper end there. I would imagine it would stand \$5,000 or \$6,000.

Q. Were any of your tools drowned out?—A. Yes; they all went to the bottom and some of the electric tools had to be rewired.

Q. Did you do much cleaning up after the water?—A. Yes; down at the bottom I had to clean up. I had a crane gang working on top of the bridge cleaning up and loading it on dump cars and taking it out and dumping it.

Mr. Howe, chief inspector for the Commission at Miraflores, stated (see p. 74, vol. 32, of the testimony):

Q. One of the claims, Mr. Howe, is that the cost of work was increased to an appreciable extent by the flooding out of the lock chambers, both at Pedro Miguel and Miraflores. Have you got any recollection of the circumstances or any information bearing on claims for increased cost on that account?—A. Not at Pedro Miguel. At Miraflores from the 1st day of September until the 13th, I think it was.

Q. If you will look on page 46, at the top of the page, you can see what their claim is.—A. August 31 to September 8; yes, sir; that claim is correct, as near as I can remember.

Q. I do not mean to question the record of the delays. What I want to find out is whether you have any recollection or data as to what that meant to the Contractor. How did he use his men, or what damage was done to his plant, or anything similar?—A. The reamers, I think it was in the east chamber, or the west chamber; the reamers were damaged there and the men were taken off those 82-foot leaves. They had to be sent to the upper level. Work was stopped there.

In relation to flooding the lock chambers and being interfered with for lack of water for the compressors, Mr. Childers states (see pp. 49 and 50, vol. 32, of the testimony):

Q. The next claim under the third is that the Commission obstructed the erection, etc. (Reads, bottom p. 45 of claims, in regard to water in the locks.) Do you know whether those dates and the amount of water mentioned there is



correct?—A. No. I know we were drowned out quite a number of times; but I don't remember the dates. I did not keep any record of it, but I know it was a source of a great deal of trouble.

Q. (Continues—water at Miraflores.) Do you know whether these are correct?—A. No; not the dates. I know we were bothered more or less.

Q. Do you know whether the second item from the bottom is correct? (Miraflores, lower level, Aug. 31 to Sept. 8, 1913, 13 feet in west chamber.)—A. No; not as to the date; but I remember the time we had the big flood in that particular chamber. We had difficulty in getting in a bulkhead or something; it laid us off for a number of days.

Q. Is the next paragraph correct? (Both at Pedro Miguel and Miraflores the water, etc.)—A. Yes; that statement is correct. Our electric reamers were flooded and things of that kind.

Q. The next paragraph says that the work was delayed and made more expensive on account of the water supply of the Commission giving out at numerous times, and the electric current furnished on many occasions being insufficient. Do you remember that?—A. At Gatun we had considerable trouble due to shortage of water. In fact we ran for quite a little while there with a shortage. I believe you remember me taking up with you that we must get water; we were tying up the compressors. We were also short of water on testing the leaves at Miraflores—I can not say as to other places, but we were bothered with it.

I think we were bothered with it testing the leaves at Gatun.

Mr. STERRETT. (Shortage of water at Gatun to cool air compressors; last paragraph, p. 46.) Do you remember that?

A. Yes; we eventually laid a special line from Gatun water tank down to our air-compressor house. (See pp. 49 and 50, vol. 32 of testimony.)

Mr. Courter, superintendent of construction at Pedro Miguel, gives his version as to the way he was obstructed by failure to keep water out of the lock chambers, and in other ways, on pages 59, 60, 61, and 62 of his testimony, volume 16. This testimony is quoted below:

Mr. STERRETT: The Contractor's second statement of the claim on page 39 is: "That the Commission obstructed the erection by its failure to keep water out of the lock chambers and in other ways." Now, do you remember to what extent the erection was interfered with by water backing into the lock chambers?

Mr. COURTER. Why, yes; two or three different times.

Mr. STERRETT. The record of the Contractor, as given on page 45, shows that the lock chambers at Pedro Miguel were flooded as follows:

May 13, 1912, water for 3 days in the west chamber.

July 12, 1912, water in sump holes, which caused sickness amongst the Contractor's men.

July 16-26, 1912, water for 10 days in the west chamber.

July 31, 1912, water for 3 days in the west chamber.

Now, you left in August?

Mr. COURTER. Yes, sir.

Mr. STERRETT. Then that is as far as you would remember. In what way, if you remember, did that water break in there?

Mr. COURTER. Why, the dam broke or something else above came down and let water into the chamber, and it filled up to 7 or 8 feet deep—up to the third story of the leaves—and we could not work, and all our tools were down in there. I had to build rafts out of timber for the men to go around; and the tracks were all up this way, and then they had to wait until the water was down and then to fix up the tracks. And I had to lay my men off.

By Judge HARRAH:

Q. How often did that occur?—A. I think that occurred three times while I was there.

Q. That same kind of condition?—A. Yes, sir.

Q. Did you take any steps to have it remedied?—A. You could not. Yes, sir; I took it up with Mr. Hinman and Mr. Cole; but the excessive rains, you know, caused a dam to burst, and it let the water come down into the chambers.

Q. Could it have been avoided by any proper precaution that the Commission might have taken to prevent it from coming down there?—A. Yes; they did

not fix the dam right, and the water they left lying in there. I asked them to pump it out several times, and then I finally got Mr. Hinman to come down with me, and I showed him. It was all covered with a green, slimy substance, and my men were all sick; and he took it up with Mr. Cole, and they came down there and they looked at it, and then they went to work and put pumps in and pumped it out, and from that time on they kept it pretty clean.

Mr. STERRETT. Do you know, while you were there, if you were interfered with in your work, as stated in that paragraph? It says:

“By water backing into the lock chambers, and in other ways.”

Were you interfered with by your water supply for keeping up your boilers running short, or were you interfered with in the electric current that they furnished?

Mr. COURTER. Several times the current was off. Once my men broke the wire down themselves with a crane and caused a delay there of about half a day; but several other times there was something wrong with the current—I do not know what it was—that stopped the whole work.

Mr. STERRETT. Stopped your compressors, and that stopped the riveting?

Mr. COURTER. Yes, sir.

Mr. STERRETT. Do you know how often that occurred?

Mr. COURTER. Well, I could not tell you just exactly; two or three times.

Mr. STERRETT. It says on page 48:

At Pedro Miguel, up to the beginning of February, 1912, the water supply was insufficient.

Do you remember anything about that?

Mr. COURTER. Yes; we had trouble with the water for our compressors all the time. They did not have power enough—pressure enough to throw the water up there to keep our compressors cool; we had to have a stream of water running on the compressors all the time.

Mr. STERRETT. Were your compressors shut down much?

Mr. COURTER. Several times; yes, sir.

Mr. STERRETT. Several times?

Mr. COURTER. Yes, sir.

Mr. STERRETT. When you say “several,” what do you mean—three or four?

Mr. COURTER. Three or four times.

Mr. STERRETT. Did you ever have to carry water from Paraiso, 2 miles away, to supply your men with drinking water?

Mr. COURTER. We had all the time to carry it.

Mr. STERRETT. You had to carry water all the time that you were there?

Mr. COURTER. Yes, sir.

Mr. STERRETT. I know when I was on the Isthmus they were carrying water for a mile, but later we got that fixed. The water was piped.

Mr. COURTER. We had a spring part of the time; but some of the dock men, Guineas, blowed the pipe out with a blast; they blowed it out, and then we had to go and carry water away up from the Paraiso spring.

Mr. STERRETT. You mean colored men, do you not? What are called “Guineas” are Italians.

Mr. COURTER. They were Spaniards; a lot of Spaniards.

In his testimony, pages 101 to 103, inclusive, volume 8, Mr. Goldmark gives his views as to the extent to which he thinks the Contractor was interfered with by water in the locks, and reiterates his statement in his report, that he thinks \$5,000 for Miraflores would be reasonable.

In answer to a direct question on this proposition, Mr. Goldmark states:

A. I think that would be reasonable, as at that time things were being pushed very hard at Miraflores. It was a very critical time, and there was a good deal of actual damage, some actual damage that had to be repaired by the Contractors; and a thorough stoppage of all work of 12 or 13 days, something like that?

Q. Was the flooding of the locks or chambers at Pedro Miguel the result of any unusual or excessive rainfall for that season of the year—in that climate down there?—A. I do not think so. There were no provisions made to take care of less rainfall, and, while I suppose the exact amount of water that got



in was due to the actual amount of rain that fell, I think in any rainy season it could have been looked for.

Q. What provision was taken by the Commission to prevent the flooding of the locks during the time of erection?—A. Well, that water all came in from the lower end, the south end, of the lock. The work began in midsummer of 1911; the work of erection began then. And nothing was done to keep out the water at the lower end of the lock at that time. And all through that rainy season the only reason why the floods did not come was because it was a very dry sort of a rainy season.

Then when the next rainy season came, in 1912, we had this series of floods, and when the first few of them came I took the ground that we ought by all means—that was October, 1911—build a barrier at the lower end of the lock; a barrier 10 or 12 feet high would be ample; not very expensive; not very troublesome. I think myself it should have been built in the beginning, without waiting for trouble. But Mr. Williamson, after he got back from his leave, took the ground that it was the Contractor's business to keep that water out of the locks, because nothing was said in the lock-gate specifications about the Commission's keeping the water out.

And that was the subject of some discussion; but it was finally decided by the chairman that, under the clause that the Commission was required to furnish foundations, and for other reasons, the Commission was under obligation to keep the water out of the locks, and the division engineer was instructed to take steps to do it, which he then did. (See pp. 103 and 104 of Mr. Goldmark's testimony, vol. 8.)

On page 105 of his testimony, Mr. Goldmark gives his views as to flooding of the locks at Miraflores that took place from August 31 to September 17, 1913. He was asked:

Did you take any special precautions to keep the water out at Miraflores during the period of erection?—A. I believe there was a small dam built at the lower end of the lower lock at Miraflores, but leakages occurred through an orifice in this dam several times between June 15, 1913, and the end of the month. They were not very important leaks.

Now, the principal trouble at Miraflores took place from August 31 and extended until about September 17. This was due to pure accident. The lower gates had been closed, and the main valves in the culverts had been closed, and I think about August 31 the large railroad dike which shut off the water of the Pacific from the lock was blown up, so that the water rose to sea level against the lower guard gates. It then appeared that one big culvert valve leaked very badly, and it took the Commission a long time to close that leak, the water rising to 13 feet in the west chamber and to about 4 feet in the east chamber. Of course, the only step to be taken then was to close that valve promptly.

Q. During that period, the work of the contractor had to be stopped in that lock, did it not?—A. Well, they may have done some little work above the water level, but, as I recollect it, they were pretty well stopped.

The testimony substantiates the claim of the Contractor that the water was not kept out of the lock chambers at all times, and that the was, to minor extent, interfered with in other ways by failure to have the necessary water for cooling his compressors.

It is also the opinion of your committee that it was the duty of the Commission to take such steps as appeared to be necessary to keep the locks free from water while the erection was going on. The amount of the claim seems to be reasonable, and it will be considered as a proper deduction from the actual expenses at Miraflores in determining a normal at Miraflores.

The next contention of the Contractor in support of claim 6, paragraph 3 of section 3, page 39 in the book of claims, is as follows:

That the Commission, through its engineers, by forcing the Contractor to punch the holes for the field rivets smaller than called for by the specifications, greatly delayed the work in the field and increased the erection cost.

This contention of the Contractor principally affects the specific claim for bolting up with small holes, reaming out the small holes, and excess riveting. (P. 75 in book of claims.) These claims will be considered in their order:

(b) *Bolting up with small holes, 37.8 per cent of \$153,303, \$57,950.*

From this it appears that it is the contention of the Contractor that 37.8 per cent of the actual expenses at Miraflores, exclusive of rush work, was caused by being required to bolt up with small bolts.

Paragraph 36 of the specifications provides that:

36. Rivet holes in all material three-fourths inch thick or over shall be drilled from the solid, the holes to be one-eighth inch smaller in diameter than the nominal size of the rivet to be used. Material under three-fourths inch thick shall be punched with a punch one-eighth inch less in diameter than the nominal size of the rivet. After the material is thus reduced or drilled it shall, after assembling in the field, have all holes reamed out to a diameter one-sixteenth inch larger than the nominal size of the rivet. Before doing this the work shall be thoroughly bolted together, so that no chips or shavings may be forced in between the assembled parts during the reaming. The outside burrs must be removed from all reamed or drilled holes by slightly countersinking the holes. After the reaming is done the parts assembled are to be riveted up as far as feasible without taking them apart.

Paragraph 121 provides that:

121. In the field erection the separate parts shall be tightly bolted together, using bolts in practically all of the holes, and the rivet and bolt holes shall then be reamed out to their full size.

Paragraph 18 of the agreement of August 8, 1910, provides that:

Wherever the skin is more than eleven-sixteenths inch in thickness on the upstream side use 1-inch rivets with 8 by 8 inch angles.

The way in which the Contractor arrives at the amount of this claim is shown on pages 76 and 77 of the claim, quoted below:

(b) *Bolting up with small holes.*—The Contractor claims that on account of the small holes he was forced to use the expense of bolting up on the part of the leaves where 1-inch rivets are used was two and one-half times as great as it should have been, and on the part of the leaves where seven-eighths inch rivets are used at least one and one-fourth times as great as it should have been. In the skin of one 77-foot leaf are used approximately 18,000 1-inch rivets and 45,000 seven-eighths inch rivets, a proportion of 2 to 5. It therefore follows that if the expense of bolting up with the larger holes would have been 7 this expense was increased by the use of small holes to 2 by  $2\frac{1}{2}$  equals \$5; 5 by  $1\frac{1}{4}$  equals \$6.25; total, \$11.25.

The normal expense should therefore have been 62.2 per cent of the actual expense the Contractor had to incur, or the Commission should pay the Contractor 37.8 per cent of the actual cost of \$153,303, or \$57,950. This would reduce the cost of bolting up from \$8.64 per ton to about \$5.06 per ton.

From this statement of the contract it appears that the only basis for determining the increased expense that was occasioned by being required to bolt up with small bolts is an estimate made by the Contractor.

Before considering this claim further, and in connection with what will follow, it is desired to call attention to certain provisions of the contract and state the effect that such provisions should have on the adjudication of claims of this character.

Article IV of the contract contains authority for changes, and provides that—

Any claim for such changes shall be made by the Contractor at the time of the changes, or no allowance will be made or money paid on account of the same.



Article X of the contract, quoted on page 275 of this report, provides that claims for compensation for extra work, labor, and material must be agreed upon in writing by the parties to the contract before the work is commenced or the labor or material furnished.

These provisions in the contract gave the Contractor specific notice that it was necessary for him to make claim for extras at the time of being required to perform work that he considered as not coming within the requirements of the contract.

One of the reasons why it is essential that such claims should be made at the time and settled while the work is in progress, is in order that they may be investigated when the facts are all available. Another reason why the compensation for changes or extra work should be agreed upon at the time the work is being performed is in order to give the Government an opportunity to avoid the increased expense of doing the extra work, unless it appears that a corresponding benefit will be received. In many cases the work could be done as well without the claimed extras as with them, and it frequently happens that what the contractor claims to be extra work does not in any way benefit the Government. Another reason is in order that the responsible persons in charge of the work may have it performed for the amounts specified in the contract. There was a clear duty upon the part of the contractor to present his claim for extra compensation at the time the work was being done. His failure to do so in this case did deprive the Government of any opportunity to investigate the claim at the time, and also tended to place it beyond the power of the responsible officer of the Commission to change the conditions. This applies particularly to the change in the specifications requiring the punching of smaller holes than were called for. If the contractor had observed the contract with respect to changes and claims for additional compensation, he would have been saved much expense, and a considerable part of the expense that was incurred in connection with the punching of the smaller holes would have been avoided altogether. It is not clear that the punching of the smaller holes was of any practical benefit to the work, even in the shop; in fact, the evidence indicates that the small holes were a detriment rather than a benefit to the completed gates. This change in the specifications as to the size of the holes did, moreover, make the work more difficult, and it increased the expense of doing it to the Contractor. The change in the specifications as to the size of the holes was a change that increased the cost of the work without any corresponding benefit to the work in the final result.

With a specific provision in the contract limiting the right of the Contractor to recover for extra work to such claims as were made at the time the work was being performed, the responsible officers of the Commission had a right to assume that extra work was not being required. If the claim had been made and it had been found that the extra work was unnecessary and of no benefit, the expense in connection with it could have been avoided altogether.

The provisions of the contract, quoted and commented upon above, were valuable to the Government, and were intended to protect it against just such claims as are now being urged as equitable, just, and fair. Notwithstanding this fact, however, the Contractor does not appear to have made any specific attempt to comply with such

provisions, further than to protest from time to time against the requirements of the Commission, without in any way attempting to point out the extent to which he was being damaged regarding increased expense for performing extra work in doing the work "under requirements as to character and finish not fairly within the meaning of the specifications."

Every person is presumed to intend the natural, necessary, and probable consequences of his own acts. The natural, necessary, and probable consequences of the acts of the Commission's engineers and inspectors to the extent that they insisted that the work should be done "under requirements as to character and finish not fairly within the meaning of the specifications" was to increase the cost of the work to the Contractor. On the other hand, the natural, necessary, and probable consequences of the acts of the Contractor in performing what he now claims was extra work caused by a change in the specifications, without making the claims that should have been made therefor under the terms of the contract, at the time the work was being performed, reserving to himself the right to submit such claims in future, as was done in this case, was, if such claims are allowed in full, to make the work more expensive without any sufficient corresponding benefit moving to the Government.

The extent to which the failure of the Contractor to observe the provisions of the contract above considered may have affected the increased expense on any claim is a proper element to be taken into consideration in determining the amount which in equity, justice, and fairness should be allowed on such claim.

The question as to the responsibility of changing the holes to a smaller diameter than that called for in the specifications is considered in detail in this report on pages 61 to 140, and it is found that (p. 140)—

The loss and damage to the Contractor due to this change, so far as it can be traced, should therefore, in equity, fairness, and justice be borne by the United States, except in so far as he may have contributed to the loss by his failure to present his claim in the manner provided for under the terms of the contract.

The way in which the Contractor arrives at the amount of the claim for bolting up is by assuming that the actual cost for bolting up was increased by 37.8 per cent on account of the change in the size of the subpunched holes. If this assumption is correct as to the actual increase due to the change in the size of the holes, the per cent of the increase in cost could have been presented at the time the change was made. The same is true as to the claim for reaming. The amount of increased expense in the item of bolting up under this assumption, not including the item of rush work that to a certain extent was dependent upon the difficulties incurred in being required to bolt up with the small bolts, was approximately \$190,000, and the increased expense claimed for reaming was approximately \$42,000.

In addition to this the evidence indicates that a very large percentage of the loose rivets resulted from the inability of the Contractor to bolt up with the small bolts. About \$100,000 should be added to the above sums to cover the extra expense claimed in having to cut out rivets due to inability to bolt up with small bolts.



If we add to these sums the amount of the claim for rush work that is dependent upon the delays and difficulties resulting from the small holes and the percentage of the claim for transportation, liability, and insurance, the total amount of the claim due to the change in the size of the holes will be between \$600,000 and \$700,000.

It is inconceivable that the Contractor should knowingly have submitted to a change in the specifications that would have caused him this much increased expense without submitting any claim for the additional expense occasioned by the change in the specifications. It is also inconceivable that the responsible engineers and inspectors for the Commission would have knowingly insisted on or advised a change in the specifications that would have had such a far-reaching effect on the work in the field. The only reasonable conclusion that can be reached from these facts, therefore, assuming that the estimates to any reasonable extent represent the actual extra expense that was incurred, is that the requirements were insisted upon without knowledge of the effect they would have upon the work, and that the Contractor was acquiescing without realizing the extent of the damage and loss that he was suffering by reason of the change in the size of the holes.

The Commission had a right to presume that the Contractor knew the extent to which any change in the specifications was affecting the work and had a right to assume that if such change was radically increasing the expenses to him without any corresponding benefit that he would present the facts in relation thereto for consideration under the terms of the contract. The inaction of the Contractor would have the effect, as it evidently did in this case, of leading the engineers and inspectors of the Government to believe that the change was sufficiently beneficial to the Contractor in some part of the work to justify him in waiving his right to extra compensation for increased expense in the field. This fact alone, however, gave no right to the Commission's inspectors and engineers to insist upon a change in the specifications against the protest of the Contractor for the benefit of the shopwork which would increase the cost of the work to the Contractor in the field and also probably increase the cost of the work as a whole.

Your committee, in attempting to fix the responsibility as to the effect of this change, does not feel that the entire burden in connection with the change should be borne by the Government. It seems that each party to the contract was almost equally at fault, at least in the beginning.

In April, 1911, Mr. Goldmark was at the works of the Contractor. The subject matter of the change in the size of the holes was then fresh in the minds of the parties and a very small part of the material had been punched with small holes, and if the question had been presented to Mr. Goldmark at that time, a claim made and insisted upon, it is entirely probable that the matter would have then been adjusted in such a way that a very considerable proportion of the expense would have been avoided. The matter was subsequently taken up with Mr. Goldmark, but at no time was Mr. Goldmark ever informed of the great increase in expense that the contractor claimed he was incurring by reason of this change in the size of the holes.



Another thing that should be noted at this time is that the claim is now incapable of any definite and certain determination. The records of the contractor were not kept with a view to ascertaining in any definite way the increased cost that was due to the change in the size of the holes as to bolting up, reaming, or riveting.

These facts indicate that the contractor and the Government's responsible officers were almost equally at fault as to the manner in which this increased expense was incurred. It seems, therefore, that such loss and extra expense as resulted from the change in the size of the holes should be divided between the Contractor and the Government. This rule would not prevail if it could be shown that the Government received a benefit in better work equal to the increased expense; neither would it prevail except for the fact that under the express terms of the contract it was the duty of the Contractor, in the first instance, to point out the extent of the damages and losses that he was incurring by reason of the change.

Equity, justice, and fairness do not permit him to stand by and remain silent where the contract expressly requires him to speak, and where, in all probability, his failure to speak resulted in a considerable portion, at least, of the increased expense being incurred without any resulting benefit. It is true that at times he did protest, but his protests were not so made as to present for consideration and determination the extent of the loss or extra expenses. This is exactly what was required of him under the terms of the contract, and it was only by his observing the condition that the Government could protect itself.

Each party should assume a burden equal to his default.

It was more difficult to bolt up with five-eighth-inch bolts, which the contractor was required to use owing to the small holes, than it would have been to have bolted up with the larger bolts that he would have been able to use if the holes had been punched in accordance with the specifications. (See Mr. Goldmark's testimony, vol 8, pp. 39 and 147 to 158, inclusive.)

On page 150 Mr. Goldmark states, in response to the question as to whether it would not be much easier to bolt up and get good results with eleven-sixteenth-inch bolts for seven-eighth-inch rivets and three-fourth-inch bolts for 1-inch rivets than it would be to do all the bolting up with five-eighth-inch bolts, stated:

Oh, an immense difference, in my opinion, particularly in the latter case.

He then explains that in the case of the small bolts there would be a tendency on the part of the workmen to slight the operation for fear of breaking the bolts or stripping the threads.

On pages 151 to 152 Mr. Wolfel and Mr. Goldmark explain that there is almost 50 per cent more area in a three-fourth-inch bolt than in a five-eighth-inch bolt, and that nearly 50 per cent more force could be applied with a three-fourth-inch bolt than a five-eighth-inch bolt, and that the danger of breaking the bolts and the tendency to slight the work for fear of breaking the smaller bolts would be to a large extent removed.

On pages 39 and 40 of his testimony, in discussing the question of changing to small holes, Mr. Goldmark stated that:

I would also say that at the time it never occurred to me that that small hole, eleven-sixteenths inch, would apply to those girders that connected to 1-inch



sheathing plates; or, in other words, that it would apply for 1-inch rivets. And when the first girders came down to the Isthmus and I found that the 1-inch rivets had eleven-sixteenths-inch holes I was very much astonished. I was always under the impression that it was one of the things that the Contractor had done, and I never protested; and I am perfectly willing to confess that I did not realize that it would make so much trouble in bolting up as it did; but I certainly never protested. I always thought that the punching of those small holes was unnecessary—at least, I always thought that the punching of the small holes for the 1-inch rivets was unnecessary, and I still think so.

The punching of the eleven-sixteenths-inch holes for the seven-eighths-inch rivets was only a decrease in size of one-sixteenth inch. And I always thought that was unnecessary, until the change was made back to the larger holes. Then it was reported to me that they simply could not get good rivets with the larger holes in the shop oven; and, while I have never been able to understand it, I gradually came to the conclusion that there was something peculiar about this work which required the small holes.

But the fitting of the rivet holes after the first eight gates was so beautiful, was so nearly perfect, that I wondered why on earth they punched them with the small holes. When Mr. Jewel asked me to change them, I said, "By all means," and then, as you know, they changed them; and they reported from Pittsburgh that it would not do, and they changed them back without telling me very much about it.

The following propositions, stated in the Contractor's brief, page 106, as modified by your committee, appear to be established by the evidence:

(1) The Contractor was forced to use five-eighths-inch bolts in the preliminary bolting, which bolts were too small to properly do the work.

(2) When material was reamed the borings had a greater tendency to get between the plates, making it more difficult at the second bolting to get the material tight before riveting.

(3) The material not being tightly bolted was the cause of a large number of loose rivets which had to be cut out and redriven.

(4) The cost of the reaming was very much increased, both in labor and tools.

The references to this testimony are as follows:

Testimony—	Volume.	Pages.
Mr. Goldmark.....	1	61, 65, and 66 (report).
Do.....	8	114, 124, 147, to 158 and 192 to 194.
Mr. Wheatcroft.....	13	96, 98.
Mr. Courter.....	16	30 to 32, 62, 63.
Mr. Hess.....	17	46, 77.
Mr. Galloway.....	23	82, 84.
Mr. Childers.....	32	50 to 52, 59 to 61, 263.
Mr. Howe.....	32	72, 74, 81.
Mr. Dumville.....	32	90 to 93, 96, 114, 115.
Mr. Wright.....	32	128, 129, 133.
Mr. Guym.....	32	161 to 165, 169, 170, 174.
Mr. Conner.....	35	19.
Mr. Lucas.....	35	26 to 32.
Mr. Mellon.....	35	45.
Mr. Hininan.....	36	6, 7.
Mr. Wright.....	36	12, 13, 22, 24.
Mr. Dumville.....	36	24, 25, 31.
Mr. Hutzley.....	37	2 (Exhibit No. 3).

After permission had been given by Mr. Goldmark in his cablegram of January 12, 1912, to punch all holes thirteen-sixteenths inch in diameter and work had been begun under this new arrangement on contract 4861, there was still difficulty in getting material accepted at the shops with the holes nearly as required in the specifications, as regards diameter.

On April 5, 1912, Mr. Pittman wrote the following letter to Messrs. C. D. Marshall, H. H. McClintic, P. L. Wolfel, and L. L. Jewel (see Exhibit No. 3 of Mr. Pittman's testimony, vol. 12) :

Attached is circular note which sets forth our conclusions relative to change in size of holes in lock-gate work. The trouble and expense we have incurred in our experience with larger holes in contract 4861 convinces us that no possible saving in cost of erecting can compensate for the loss of material through rejections at shop and the increased cost of shopwork.

The first two girders on contract 4861 that were fitted had to be taken apart and the angles sent back to bulldozer for stretching and resetting. One of the girders was rejected after being reamed, but it was again placed under gantries and most of the holes reamed to 1 inch, after which we finally succeeded in getting it accepted. We tinkered with these two girders about a week. We also experienced some trouble owing to the use of three different size holes—eleven-sixteenths, three-fourths, and thirteen-sixteenths inch. In one case a seven-eighths-inch die was used in connection with a three-fourths-inch punch. In the light of this experience, it is believed best to use only two size holes—eleven-sixteenths and thirteen-sixteenths inch. These are far enough apart in size to avoid getting punches and dies mixed.

All work with large holes is scrutinized very closely by the inspectors and much of it is held up for more careful measuring. This greatly delays the shopwork, even when no rejections result.

In this letter Mr. Pittman states as a reason for his action that—

The trouble and expense we incurred in our experience with larger holes under contract 4861 convinces us that no possible saving in cost of erection can compensate for the loss of material, the rejection at shops, and the increased cost of shopwork.

The Contractor now claims, as has heretofore been shown, that the increased expense in the field, which is traceable to punching of smaller holes than required in the specifications, amounted to between \$600,000 and \$700,000. The entire departmental shop labor cost was \$474,161.54. If we add to this the general expense and loss due to rejected material, all of the expense of fabricating the lock-gate material in the shops at Rankin was considerably less than \$1,000,000. If the claim of the Contractor as to the effect of the small holes on the work in the field is even approximately correct, it shows how little the manager of the McClintic-Marshall Construction Co.'s plan at Rankin knew about the class of work that was required in the field on the lock-gate material. It is also to be noted that this letter was sent to Mr. Marshall, president of the company, Mr. McClintic, vice president of the company, Mr. Wolfel, the chief engineer of the company, and Mr. Jewel, manager of erection of the company, and so far as the records show, no further action, at least in a way that would produce any results, was taken.

From the testimony of Mr. Goldmark, it now appears that he never thought it was necessary to have the holes for the 1-inch rivets punched smaller than seven-eighths inch.

The part of the testimony of Mr. Goldmark quoted above (pp. 314 and 315 of this report) is considered in the testimony of Mr. Pendergrass (p. 96, vol. 15). A part of the testimony of Mr. Goldmark quoted above (p. 39 of his testimony) was quoted in the testimony of Mr. Pendergrass, but the following (p. 39 of Mr. Goldmark's testimony) was omitted :

I am perfectly willing to confess that I did not realize that it would make so much trouble in bolting up as it did, but I certainly never protested. I always thought that the punching of those small holes was unnecessary, at least I always thought that the punching of the small holes for 1-inch rivets was unnecessary, and I still think so.



The following paragraph in Mr. Goldmark's testimony was erroneously quoted, so that it read:

The punching of the eleven-sixteenths-inch holes for seven-eighths-inch rivets was only a decrease in the size of one-sixteenth inch, and I always thought that was necessary until the change was made to the larger holes.

What Mr. Goldmark did say was:

The punching of the eleven-sixteenths-inch holes for seven-eighths-inch rivets was only a decrease in size of one-sixteenth inch, and I always thought that was necessary until the change was made back to the larger holes.

The following statement was also made by Mr. Goldmark in connection with the statement quoted above:

Then it was reported to me that they simply could not get good results with the larger holes in the shop even, and, while I have never been able to understand, I gradually came to the conclusion that there was something peculiar about this work which required the small holes.

After this part of the testimony of Mr. Goldmark had been read by Mr. Wolfel he asked Mr. Pendergrass:

Now, you remember after a while we built for the Isthmian Canal Commission the dock gates, our contract 6173?

Mr. PENDERGRASS. Yes, sir.

Mr. WOLFEL. The construction of the skin of the dock gates follows the construction of the skin in the lock gates?

Mr. PENDERGRASS. Yes, sir.

Mr. WOLFEL. We have the seven-eighths inch rivets above the air chamber in the downstream side and the 1-inch rivets on the upstream side in the air chamber; is that right?

Mr. PENDERGRASS. Yes, sir; I think that for that part of the work there were new designs furnished, but the typical drawings for the lock gates were used.

Mr. WOLFEL. Well, but you had the layouts that showed the general arrangement required?

Mr. PENDERGRASS. Yes, sir.

Mr. WOLFEL. Can you tell us by whom they were prepared or submitted?

Mr. PENDERGRASS. They were submitted by Mr. Henry Goldmark and Mr. F. H. Cook, designing engineers.

Mr. WOLFEL. Now, for these particular gates what size holes did you punch in the skin in the shop?

Mr. PENDERGRASS. Eleven-sixteenths inch, in accordance with circular 725, being the specifications for that work. In paragraph——

Judge HARRAH (interposing). What is the date of that circular?

Mr. PENDERGRASS. The circular is dated August 13, 1912, for one mitering dock gate, two leaves, Washington order 35042.

Mr. WOLFEL. I wish you would read that first portion of paragraph 31 in the record, page 8.

Mr. PENDERGRASS (reading). "Rivet holes in all material over three-fourths inch thick shall be drilled from the solid; in material under three-fourths inch thick they may be punched; all holes shall be at least one-eighth inch smaller than the nominal size of rivet for shop-driven rivets and eleven-sixteenths inch diameter for holes in which the rivets will be driven in the field."

Mr. WOLFEL. Well, this was followed especially for the interior connections, was it not?

Mr. PENDERGRASS. Yes, sir.

Mr. WOLFEL. And how were they gotten out?

Mr. PENDERGRASS. The holes for the frames were reamed to templet in the shop.

Mr. WOLFEL. The same as for the lock gates?

Mr. PENDERGRASS. The same as for the lock gates.

Mr. WOLFEL. That is all I have about that.

The action of Mr. Goldmark under the dock-gate contract, requiring all field holes in which rivets would be driven in the field to be eleven-sixteenths inch in diameter, was perfectly consistent

with his statement that “he gradually came to the conclusion that there was something peculiar about this work which required the small holes.” It also shows how important it was for the Contractor, if he was being injured by the small holes in the field work to the extent that he now claims, to have made his claim under the contract for the change in the specifications and to have pointed out in what way the cost was being increased, so as to have given a basis for future action. It is entirely probable that if this had been done the situation in connection with the small holes would have been radically changed. It is not unreasonable, therefore, to conclude that the primary responsibility for a considerable portion of the increased expense due to a change in the specifications as to the size of the holes rests with the Contractor and was caused by his failure to observe the very important provision in the contract relative to presenting claims for extra compensation in case of change at the time of the change.

One-half of whatever excess expense was caused by the change in the specifications as to the size of the holes will therefore be charged to the Contractor, and the amount to be deducted from the actual expenses in determining the normal in the way in which it is determined on page 75 of the Contractor’s claim will be reduced by one-half.

The table below shows the various items in the estimate made by Mr. S. P. Mitchell on a tonnage of 58,170, the total cost of each item, cost per ton of each item, cost per leaf, the number of field rivets, cost per field rivet or hole, number of square-feet surface in end plates, and number of linear feet of end plates.

*S. P. Mitchell's estimate of Sept. 16, 1914, on erection (labor).*

[Assumed total tonnage, 58,170.]

Item No.		Total cost.	Cost per ton.	Cost per leaf (92 leaves).	Number field rivets.	Cost per field rivet or hole.	Square feet surface in end plates.	Linear feet of end plates.
1	Yard labor.....	\$46,800	\$0.804	\$508.00	5,730	.....	21,850	10,702
2	Erection bridges.....	15,400	.264	167.50	.....	.....	.....	.....
3	Temporary supports.....	32,200	.554	350.00	.....	.....	.....	.....
4	Erecting gates.....	312,000	5.300	3,392.00	.....	.....	.....	.....
5	Bolting up.....	260,000	4.470	2,625.00	5,730	\$0.0454	.....	.....
6	Reaming.....	208,000	3.570	2,260.00	5,730	.0383	.....	.....
7	Riveting.....	458,400	7.870	4,990.00	5,730	.0810	.....	.....
8	Calking.....	81,600	1.400	887.00	.....	.....	.....	.....
9	Grinding B. P. and setting R. C.....	64,400	1.105	700.00	.....	.....	.....	.....
10	Setting and babbitting S. B. P.....	58,000	.996	631.00	.....	.....	.....	.....
11	Placing pintles and yokes and setting leaves on pintles.....	46,000	.790	500.00	.....	.....	.....	.....
12	Placing wooden sills and tenders.....	5,300	.091	57.60	.....	.....	.....	.....
13	Placing concrete in bottom gates.....	4,500	.077	48.80	.....	.....	.....	.....
14	Placing piping, etc., pumping system.....	13,800	.237	150.00	.....	.....	.....	.....
15	Placing sidewalks and railings.....	8,200	.141	89.20	.....	.....	.....	.....
16	Placing manhole covers and doors.....	10,600	.182	115.20	.....	.....	.....	.....
17	Cleaning and painting (2 coats R. S. outside only).....	65,000	1.115	707.00	.....	.....	.....	.....
18	Field expenses.....	150,000	2.580	1,630.00	.....	.....	.....	.....
	Total.....	1,840,200	31.640	.....	.....	.....	.....	.....

This table only takes into consideration the labor items and the part of field expenses as is considered belongs to labor items.



If this estimate should be increased as shown on page 265 of this report, and the \$150,000 for field expenses and this increase distributed pro rata among the various items, it would amount to an increase in each item of 27.25 per cent. If this percentage of increase should be applied to the item for bolting up it would make the normal cost of that item \$5.69 per ton.

The actual cost of bolting up at Miraflores was \$8.64 a ton, exclusive of the amount claimed for rush work. Five dollars and sixty-nine cents a ton deducted from \$8.64 a ton would leave the excess \$2.95 a ton. If this should be taken as the excess cost per ton for bolting up with small bolts and one-half of it charged to the Contractor, it would make the deduction to be made from the actual expenses in establishing a normal (p. 75 of the claim) for the bolting up \$26,184.20.

In coming to the conclusion that the responsibility for the results in the field and extra expenses in connection with bolting up with small bolts should be divided, full consideration has been given to the numerous protests made by the Contractor against the use of small holes. (See testimony of Mr. Wolfel, pp. 219 to 232, inclusive.)

That the responsible officers of the Contractor were advised by their manager in the field of the extra cost of erection due to a change in the size of the holes, is shown by the following letter from Mr. Jewel to Mr. H. H. McClintic dated August 15, 1911, Exhibit No. 69 of Mr. Wolfel's testimony, volume 7:

Do you not think that it is a serious mistake to ship this work with the holes subpunched eleven-sixteenths diameter? I wrote you when this question first came up that I thought it was wrong, and there is no question but it will cost more money here in the erection, and I can not see why three-sixteenths inch smaller than the diameter of the rivets to be used would not give the shop all the necessary leeway. It will certainly be a job to assemble all our work and fit it using only five-eighths and one-half inch bolts.

To-morrow I will have a meeting with the chairman in reference to program of erection and will write you the result immediately. I do not believe it will be possible to make up all our lost time with only two erection outfits and unless we get an entire revision on the completion dates, I am afraid the question of penalty will be troublesome.

Yet, notwithstanding this knowledge and these facts, no claim for increased compensation due to such damage was ever made by the Contractor, neither did he at any time during the entire consideration of the claim for delays point out delays or attempt to obtain additional time because of the delays resulting from a change in the size of the holes, as he was bound to do under the terms of the contract.

It would be neither fair, just, nor equitable for him now to be reimbursed for all of the very large expenditures resulting from the fabrication of the work with the small holes, when in all probability if a very feeble attempt on his part had been made to observe very important provisions of the contract, requiring him to submit claims for extras when changes in the specifications were made, the work would have been done under entirely different conditions.

There is no way of checking, absolutely, the excess cost of bolting up, and it is believed that the excess shown on page 322 of this report represents as nearly as can be arrived at the part that should be charged exclusively to the action of the Commission or further divided between the Commission and the Contractor if the final examination of the claim as a whole should justify such action. In

other words, the excess shown represents only such part of the claimed excess as it is considered, under any circumstances, should be allowed, the remainder of the claimed excess being eliminated from further consideration.

REAMING—HAND AND MACHINE.

Punching the holes smaller than provided for in the specifications affected the cost of the reaming. The claim of the Contractor as to the way the cost of reaming was affected, so far as Miraflores is concerned, is stated on page 75 of the claim, as follows:

(c) *Reaming out the small holes, one-fourth of \$53,070, \$13,267.50.*

The way in which the amount of the claimed excess for reaming is arrived at is shown on pages 77 and 78 of the claim, as follows:

(c) *Reaming out the small holes.*—Based on the same proportion of different-sized holes of 2 to 5, given under “b,” the explanation for this is as follows:

The metal we should have reamed out, if the specifications had been followed for the holes for the 1-inch rivets and seven-eighths-inch rivets, are as follows:

	Square inch.
1½-inch holes area-----	0. 8866
Seven-eighths-inch holes area-----	. 6013
	<hr/>
	. 2853
	<hr/>
Fifteen-sixteenths-inch holes area-----	. 6903
Three-fourth-inch holes area-----	. 4418
	<hr/>
	. 2485

The metal actually reamed out, however, is:

1½-inch holes area-----	0. 8866
Eleven-sixteenths-inch holes area-----	. 3712
	<hr/>
	. 5154
	<hr/>
Fifteen-sixteenths-inch holes area-----	. 6903
Eleven-sixteenths-inch holes area-----	. 3712
	<hr/>
	. 3191

Therefore the proportion of the excess reaming to the normal reaming can be established.

	Square inch.
Normal reaming:	
2×0. 2853 equals-----	0. 5706
5×0. 2485 equals-----	1. 2425
	<hr/>
	1. 8131
	<hr/>
Actual reaming:	
2×0. 5154 equals-----	1. 0308
5×0. 3191 equals-----	1. 5955
	<hr/>
	2. 6263

This shows that the Contractor actually reamed in the field 45 per cent more than he should have reamed under the specifications, or that 31 per cent of the reaming that was done in the field was in excess of the specifications. Making allowance for the time consumed in moving the tools from one hole to the other, the Contractor therefore claims that he should be compensated for the one-quarter of the total cost of this field reaming of \$53.070, or \$13,267.50.



It appears from this statement that no part of the excess cost for reaming resulted from any unreasonable inspection demands in the field in connection with the reaming. The entire excess cost is arrived at by comparing the amount of metal that should have been reamed out, if the specifications had been followed, with the amount of metal that was reamed out under the specifications as changed. The calculation is based upon the assumption that the actual removal of the metal from the smaller holes would cost as much as the removal of a like quantity of material from the larger holes. As the tools would not have to be moved any more for reaming the smaller holes than for the larger holes, the Contractor makes an allowance for his ability to remove more metal from the smaller holes with less moving. His final conclusion is that the cost of field reaming was increased  $33\frac{1}{3}$  per cent over what it would have been if the size of the holes had been punched as provided for in the specifications.

The basis upon which the Contractor arrives at the comparative cost for reaming out the holes of the different sizes is shown in the following equation:

Let X equal time that would have been spent in reaming out large holes.

Let Y equal time spent in moving from hole to hole.

Let Z equal time spent in reaming out small holes.

$$\frac{133\frac{1}{3} X}{100} + \frac{133\frac{1}{3} Y}{100} = \frac{145 X + Y}{100}$$

Multiplying by 300:  $400 X + 400 Y = 435 X + 300 Y$ .

Subtracting:  $100 Y = 35 X$

$$Y = \frac{35 X}{100}$$

$Y : X + Y :: 35 : 135$ .

$Y = 26$  per cent of  $X + Y$ .

$$Z = \frac{145 X}{100}$$

$Y : Z :: 35 : 145$ .

$Y : Z + Y :: 35 : 180$ .

$Y = 19.4$  per cent of  $Z + Y$ .

From this equation it appears that the Contractor bases his calculations upon the assumption that 19.4 per cent of the total time would be consumed in moving the reamer. The calculations are also based upon the theory that the same proportion of metal as compared with the size of the holes would be reamed out with holes punched in accordance with the specifications as would be reamed out with holes punched smaller than required under the specifications. This does not take into consideration the probability that a greater per cent of holes punched in accordance with the specifications would be required to be reamed out to the next larger size than if the holes had been punched smaller. That this is an element that should be taken into consideration is shown from the report of

Mr. Guynn made December 15, 1914, found in volume 33-A of the evidence. On page 7 of this report Mr. Guynn states, paragraph 6:

That there were a large number of unfair holes in the sheathing, doubling, and cover plates, especially at the curved ends, caused a large number of holes to be reamed on all sorts of angles, some of which were practically blind and had to be reamed to an increased size, and even then they failed to clean up in the chord angles, so much so that it was necessary to drive the rivets from the inside of the leaf instead of from the outside.

It is self-evident that the nearer the holes are punched to the final size of the rivets, if the same percentage of holes are to be made to clean up, the greater will be the probability or necessity of reaming out holes for the next larger size of rivet. In fact, a very large part of the contention in connection with the reduction in the size of the holes revolved around the proposition that, in order to get fair holes with punching in accordance with the sizes called for in the specifications, too many holes would have to be reamed out for the next larger size of rivet. (See statement of Mr. John Ostrom, p. 71 of this report.) To ream out for the next larger size of rivet would increase the amount of metal to be removed, and any condition that would tend to increase the number of unfair holes would tend to increase the amount of reaming to the next larger size of rivet and would tend to destroy the accuracy of any comparison based on an assumption that the amount of reaming for the next larger size rivet would be uniform, regardless of the size of the subpunched holes.

Mr. Guynn's statement, above quoted, is corroborated by the analysis of cost of reaming on the 54-foot 8-inch leaves that were punched in accordance with the specifications. The cost of reaming the 54-foot 8-inch leaves at Gatun, not including salaries and special No. 21, was \$5.87 per ton. The cost of reaming the 54-foot 8-inch leaves at Pedro Miguel, not including salaries and special No. 21, was \$4.67 per ton. The cost per ton for reaming at Miraflores, exclusive of rush work and exclusive of special No. 21 and salaries, was \$2.72. The price per ton at Gatun for 54-foot 8-inch leaves was \$5.87. If we reduce this by the percentage of rush work assumed at Miraflores it would leave \$4.96 per ton. If this is further reduced to take care of the 50 per cent increase allowed on the first eight leaves at Gatun, the increase for beginning shown on page 85 of the Contractor's claim, it would give \$3.30 as the cost per ton for reaming the 54-foot 8-inch leaves at Gatun. The cost per ton at Pedro Miguel for reaming the 54-foot 8-inch leaves was \$4.67. If this was reduced by the percentage of rush work, it would leave \$3.94 a ton for reaming. If this is further reduced by 30 per cent for erecting the first leaves as shown on page 85 of the Contractor's claim, it would give \$3 per ton as the cost for reaming the 54-foot 8-inch leaves at Pedro Miguel.

This shows that the cost of reaming at Gatun and Pedro Miguel, on the leaves that had been punched in accordance with the specifications, after reducing the cost by the percentage of rush work and by the percentage necessary to take care of the increase for beginning the work, was greater than it was at Miraflores.

Several conclusions might be drawn from this. If we assume that sufficient allowance has been made to cover all abnormal conditions at Gatun and Pedro Miguel, it would show that the estimated normal at Miraflores was entirely too low. It might also indicate that the



punching on the first eight leaves under the original specifications was not as accurately done as it was later when they were using the steel templets. It also might indicate that the cost per ton for reaming subpunched hole of different sizes with relation to the size of the rivet to be used can not, with any degree of certainty, be compared with the amount of metal to be removed from the respective holes. It might also indicate that the reaming at Miraflores was not affected to the same extent on account of the rush work as were other parts of the work. It might also indicate that the calculations as to the effect of the rush work on the expenses of doing the work was too great, as stated in the claim of the contractor, page 75.

Whatever may be the correct conclusions to be drawn from the facts stated above, they do raise a fairly strong presumption against the Contractor's claim that the reaming was increased  $33\frac{1}{3}$  per cent over what it should have been by the use of smaller holes.

Mr. Mitchell's estimate for reaming was \$3.57 per ton.

It does not seem that the normal cost for reaming under the original specifications, making due allowance for the great accuracy in the punching that was shown after making the steel templets, should be fixed at less than \$2.72 per ton.

At \$2.72 per ton for reaming at Miraflores, the cost would have been \$48,285. The actual cost for reaming, exclusive of the rush work, was \$53,070, making the difference between the actual cost and the normal, if fixed at \$2.72, \$4,785—the amount to be deducted from the actual cost at Miraflores, exclusive of rush work, in establishing the normal as shown on page 75 of the claim.

For the reason given under the item of bolting up, the Contractor should be required to bear one-half of the expense because of his failure to observe the provisions of the contract and submit a claim for increased expenses at the time, and under conditions when such expenses might have been avoided. This would leave the amount to be deducted from the actual cost at Miraflores, on account of reaming, to establish a tonnage price, exclusive of rush work, \$2,392.50. (See p. 75 of the Contractor's claim.)

The above sum seems too small and it is believed that the Contractor will be required to bear his proportion of the probable excess cost by fixing the amount to be deducted at \$4,785. The above figures show that at least this much of a reduction in the claim is justified.

#### RIVETING.

On page 49 of the Contractor's claim he states, among other things:

Fourth. That the Commission's inspectors on the Isthmus were unreasonable in their requirements.

On the same page he states:

We give below a statement of some of the important and unreasonable demands made by the inspectors on the Isthmus:

"(a) The Contractor was obliged to cut out, redrive, and waste 1,561,000 rivets over and above the number which would customarily be cut out, re-driven, and wasted on high-class bridge or structural work. As the cost of cutting out rivets is greater than driving them, and the cost of redriving these rivets is very much greater than the original cost of driving, it is readily seen that the delay and additional cost from this source was enormous."

These are the only two parts of the statement on this page which relate to riveting.

On pages 51, 52, and 53 of the claim the contentions the Contractor makes in relation to unreasonable rivet inspection are stated, and for easy reference these are quoted below:

No difference can be shown between the specifications for high-grade bridge work now being constructed in this country and the specifications for the lock gates as regards fieldwork, but when a comparison is made between the actual field requirements for high-grade structural or bridge work and the requirements for the lock gates as enforced at the Isthmus, a great difference is apparent.

One of the big jobs in connection with the erection of the canal gates on the Isthmus was the driving of rivets—about 5,730,000 being required in the work. In high-grade bridge work constructed by the Contractor, like the cantilever bridge for the Pittsburgh & Lake Erie Railroad over the Ohio River at Beaver, Pa., amounting to about 16,000 tons of structural steel; and the Winner Bridge over the Missouri River, at Kansas City, Mo., requiring about 18,000 tons of structural steel, the rejections by the inspectors of the number of rivets driven compared with that of the lock gates shows a very high degree of refinement in the requirements for the lock gates—almost beyond conception as compared with bridge work.

The condemnation of the number of rivets driven in the field for the cantilever bridge over the Ohio River at Beaver was about  $2\frac{1}{2}$  per cent of the total number driven, and in the Winner Bridge at Kansas City, over the Missouri River, about  $3\frac{1}{4}$  per cent of the total number of rivets driven.

Under the most severe inspection on high-grade bridge work contractors in estimating consider that the rejections will never run over 5 per cent. Never are more than 10 per cent excess field rivets provided in any contract to cover both rejections and losses, and a liberal portion of these rivets are as a rule returned to the shop. For the lock gates there were actually used up over 7,865,000 field rivets, an excess of over 2,135,000 field rivets, or about 37.25 per cent over and above the 5,730,000 that actually were required for the finished leaves—an appalling proposition to the Contractor who had to do the work.

Mr. J. O. Childers, general superintendent for the Contractor on the Isthmus from about September 1, 1912, to the finish of the work, and who also had charge of the erection of the cantilever bridge at Beaver, Pa., and the Winner Bridge over the Missouri River at Kansas City, both previously referred to, in a signed statement says:

“The inspection on riveting at Gatun and to a certain extent at Pedro Miguel was the most rigid I ever experienced. In other words, on first inspection, nothing but a perfect rivet would be passed. Hundreds of thousands of rivets were cut out which would have answered every requirement on any other job. In many cases good rivets were cut out and redriven so often that the plates were damaged, and the rivets finally accepted were inferior to those first driven.”

Mr. Charles Welker, superintendent at Pedro Miguel for the Contractor, states:

“Riveting was much higher (meaning cost) on account of inspection. A rivet out of line one-fourth inch had to be cut out, or one that had been marked with a maul in cutting out others; or one that had a trifle too much stock, or if the inspector imagined he felt a jar, he would not pass it. In cutting out the rivets it bends and jars the iron and loosens other good rivets around them, which finally had to come out and be redriven. If in reaming the holes (outside and inside these did not match) or if it left a hole a little out of round in the outside sheathing which could easily be filled with a rivet, it would not be passed. The hole had to be drilled out to a perfect hole and a large rivet used to fill the hole. In some cases it was necessary to have the blacksmith make a rivet large enough to fill such holes. The inspection was just as stiff above the water-tight compartments as below.”

Mr. Grant Courter, for a while superintendent for the Contractor at Pedro Miguel, states:

“On account of the severe inspection of the rivets by the inspectors, who in my opinion were prejudiced against the negroes, and cut out rivets that were positively good, in order to make our company put on all white shipyard riveters,



we were compelled to keep a force of men cutting out rivets all the time, which made the rivets cost 30 cents apiece instead of from 5 to 7 cents, as on all high-class structural work.

The way in which the Contractor undertakes to establish the excess cost for riveting is shown on pages 78, 79, 80, and 81 of the claim. This statement is so important in its relation to this claim that it is quoted in full below:

(c) *Excess riveting.*—In the finished leaves are 5,730,000 rivets that have been driven in the field. To do this the Contractor has used up at the Isthmus 7,762,000 rivets—an excess of 35.46. Four per cent, or 230,000 rivets, will be allowed for rivets burned or lost, and 6 per cent, or 344,000 rivets, conceded for rivets cut out under normal inspection. On the basis given above, 10 per cent are conceded as a normal loss, which is the total excess rivets shipped on all bridge contracts, of which excess, however, as a rule, a liberal portion is returned to the works.

It is a well-established fact that it costs over one and one-half times to two times as much to cut out a rivet than it coss to drive it originally, and that the redriving of the cut-out rivets costs about the same as the cutting out.

Based on these assumptions, and on the actual cost of riveting at the three sites, the following table has been prepared in which table “X” represents the cost of the original driving.

[Cutting out and redriving=3 x. Cost of original driving x=5.89 cents per rivet.]

Location.	Net number of field rivets required.	Cost of riveting.						Field rivets cut out.			
		Actual.		Normal.		Excess.		Total.	Per cent.	Excess.	
		Total.	Per rivet.	Total.	Per rivet.	Total.	Per cent.			Total.	Per cent.
			Cents.		Cents.						
Gatun.....	2,508,000	\$313,000	12.48	\$174,300	6.95	\$138,700	79.5	934,600	37.2	784,000	31.2
Pedro Miguel.....	1,476,000	175,000	11.86	102,600	6.95	72,400	70.5	497,600	33.8	409,000	27.8
Miraflores.....	1,746,000	168,150	9.63	121,300	6.95	46,850	38.6	369,800	21.2	265,000	15.2
Total.....	5,730,000	656,150	11.45	398,200	6.95	257,950	64.8	1,802,000	31.4	1,458,000	25.4

[Cutting out and redriving=4 x. Cost of original driving x=5.07 cents per rivet.]

Gatun.....	2,508,000	\$313,000	12.48	\$157,800	6.29	\$155,200	93.5	915,600	36.5	765,000	30.5
Pedro Miguel.....	1,476,000	175,000	11.86	92,800	6.29	82,200	88.8	493,600	33.4	405,000	27.4
Miraflores.....	1,746,000	168,150	9.63	109,800	6.29	58,350	53.1	392,800	22.6	288,000	16.6
Total.....	5,730,000	656,150	11.45	360,400	6.29	295,750	81.9	1,802,000	31.4	1,458,000	25.4

From this table it will be seen that the actual cost of a finished rivet in the leaf is at Miraflores, 9.63 cents; at Pedro Miguel, 11.86 cents; at Gatun, 12.48 cents; the average, 11.54 cents.

That there was cut out at Miraflores from 369,800 to 392,800 rivets, or from 21.2 to 22.6 per cent.

At Pedro Miguel from 493,600 to 497,600 rivets, or from 33.4 to 33.8 per cent.

At Gatun from 915,600 to 934,600 rivets, or from 36.5 to 37.2 per cent.

A total cut out of 1,802,000 rivets, or 31.4 per cent.

That the excess cut out over the 6 per cent permissible under normal inspection was, at Miraflores, from 15.2 to 16.6 per cent; at Pedro Miguel, from 27.4 to 27.8 per cent; at Gatun, from 30.5 to 31.2 per cent; or an average of 25.4 per cent.

That the money the Contractor had to spend over and above what he should have spent under normal inspection amounted to \$46,850 to \$58,350, or 38.6 to 53.1 per cent at Miraflores; \$72,400 to \$82,200, or 70.5 to 88.8 per cent at Pedro Miguel, and \$138,700 to \$155,200, or 79.5 to 98.5 per cent at Gatun.

These percentages are based on the amount that should have been spent under normal inspection (100 per cent).

The Contractor claims that this riveting could and should have been done for from \$360,400 to \$398,200, while it actually cost him \$656,150, an excess of from \$297,950 to \$297,750, or 64.8 to 81.9 per cent, and that this large extra expense is due to the extreme and unreasonable inspection under which the Contractor had to execute this contract.

The Contractor draws special attention to the comparative showing of the costs and the number of rivets cut out at the three lock sites, which is a clear indication of the degree of unreasonableness of the inspection at the three sites.

The Contractor claims that the Commission, on account of the unreasonable action of their inspectors at Miraflores, in cutting out rivets to an extent never heard of before, should reimburse him for the average amount established in the table, which is \$46,850 plus \$58,350, divided by 2, or \$52,600.

The Contractor's reference to the testimony, on which he relies in support of his claim that the inspectors on the Isthmus were unreasonable in their requirements as to the rivet inspection, is found on pages 108 to 116, inclusive, of his brief.

With relation to the inspection in general he cites the following:

Testimony of.	Volume.	Pages.	Testimony of.	Volume.	Pages.
Mr. Goldmark..	8	112, 130, 132, and 194 to 197.	<i>Number of cut-outs.</i>		
Mr. Sterrett....	9	24 to 27, 38 and 39.	Mr. Goldmark..	1	68 (report).
Mr. Courter.....	16	25 to 27, 33, 64, 66, 68, 107, 109 to 112, 119, and 120.	Do.....	8	126, 127, 135, 141, 143.
Mr. Hess.....	17	32, 35, 39, 40, 42, 45, 52, 53, and 75.	Mr. Courter.....	16	25, 64, 65.
Mr. Morse.....	19	3, 13, 14, 15, 17 to 19.	Mr. Hess.....	17	33, 35, 39, 43, 77.
Mr. Galloway...	23	76, 77, 79, 83, 86 to 91.	Mr. Galloway...	23	78, 79, 81.
Mr. Jervy.....	24	16 and 17.	Mr. Childers....	32	53, 258.
Mr. Childers....	32	52, 53, 60, 61, 258, 259, and 265.	Mr. Howe.....	32	72.
Mr. Howe.....	32	77 and 81.	Mr. Dumville...	32	96, 116, 119, 120.
Mr. Dumville...	32	93 to 96, 100 and 101.	Mr. Wright.....	32	129, 130.
Mr. Wright.....	32	129, 130, 133, 134.	Mr. Guynn.....	32	171 to 174.
Mr. Guynn.....	32	171 to 175, 181, 182, 190, 195 to 199, 202.	Mr. Connor.....	35	6 to 16.
Mr. Nutting....	32	244.	Mr. Mellon.....	35	46.
Mr. Connor.....	35	5, 6, 17, and 20.	Mr. Roberts....	35	50.
Mr. Mellon.....	35	39, 45.	Mr. Hinman....	36	5.
Mr. Roberts....	35	52.	Mr. Wright.....	36	10.
Mr. Wright.....	36	10, 11, 15 to 17, 22.	<i>Rivets lost or wasted.</i>		
Mr. Monniche..	37	18 and 19.	Mr. Goldmark..	8	135, 136, 237.
<i>Causes of cut-outs.</i>			Mr. Sterrett....	9	28, 29.
Mr. Goldmark..	1	71 (report).	Mr. Courter.....	16	118.
Do.....	8	124, 134, 147 to 152, 154, 155 to 158, 230 to 233, 237.	Mr. Hess.....	17	47.
Mr. Sterrett....	9	36.	Mr. Guynn.....	32	173, 205.
Mr. Courter.....	16	25, 30.	<i>Cost of driving rivets.</i>		
Mr. Hess.....	17	40, 44, 46.	Mr. Childers....	32	60.
Mr. Morse.....	19	30.	Mr. Wright.....	36	10.
Mr. Galloway...	23	82 to 84.	<i>Cost of cutting out and re-driving.</i>		
Mr. Childers....	32	52, 53, 63, 259 and 263.	Mr. Hess.....	17	35, 39, 41.
Mr. Howe.....	32	72, 84.	Mr. Howe.....	32	83.
Mr. Dumville...	32	96 to 99, 101, 115.	Mr. Wright.....	32	141.
Mr. Wright.....	32	129, 133.			
Mr. Guynn.....	32	174, 176.			
Mr. Connor.....	35	3, 8, 15.			
Mr. Mellon.....	35	45.			
Mr. Roberts....	35	50 and 51.			
Mr. Wright.....	36	15.			
Mr. Dumville...	36	30.			

Before considering the evidence in detail a short analysis of the table on page 285 will be made, showing what it means in time and expense in connection with various operations on the assumptions used in the preparation of this table.



The tables below indicate the conditions that existed if the assumptions of the Contractor in his tables are correct:

## Gatun:

Cost of driving rivets accepted at the first driving, 1,573,400 rivets, at \$0.0589	\$92, 673. 26
Cost of driving 6 per cent, cut-outs allowed, 150,600 rivets, at \$0.2356	35, 481. 36
Cost of original driving, excess cut-outs, 784,000 rivets, at \$0.0589	46, 177. 60
Total admitted cost	174, 332. 22
Cost to cut out and redrive, excess claimed, 784,000 rivets, at \$0.1767	138, 532. 80
Total actual cost	312, 865. 02
Cost to drive, cut out, and redrive all cut-outs, 934,600 rivets, at \$0.2356	220, 191. 76
Cost of driving rivets accepted at the first driving, 1,573,400 rivets, at \$0.0589	92, 673. 26
Total actual cost	312, 865. 02

## Pedro Miguel:

Cost of driving rivets accepted at the first driving, 978,400 rivets, at \$0.0589	57, 727. 76
Cost of driving 6 per cent, cut-outs allowed, 88,600 rivets, at \$0.2356	20, 874. 16
Cost of original driving, excess cut-outs, 409,000 rivets, at \$0.0589	24, 090. 10
Total admitted cost	102, 692. 02
Cost to cut out and redrive, excess claimed, 409,000 rivets, at \$0.1767	72, 270. 30
Total actual cost	174, 962. 32
Cost to drive, cut out, and redrive all cut-outs, 497,600 rivets, at \$0.2356	117, 234. 56
Cost of driving rivets accepted at the first driving, 978,400 rivets, at \$0.0589	57, 727. 76
Total actual cost	174, 962. 32

## Miraflores:

Cost of driving rivets accepted at the first driving, 1,376,200 rivets, at \$0.0589	81, 057. 18
Cost of driving 6 per cent, cut-outs allowed, 104,800 rivets, at \$0.2356	24, 690. 88
Cost of original driving, excess cut-outs, 265,000 rivets, at \$0.0589	15, 608. 50
Total admitted cost	121, 356. 56
Cost to cut out and redrive, excess claimed, 265,000 rivets, at \$0.1767	46, 825. 50
Total actual cost	168, 182. 06
Cost to drive, cut out and redrive all cut-outs, 369,800 rivets, at \$0.2356	87, 124. 88
Cost of driving rivets accepted at the first driving, 1,376,200 rivets, at \$0.0589	81, 057. 18
Total actual cost	168, 182. 06

Based on the second table of the Contractor and the assumption that the original driving cost was \$0.0507, and to cut out and redrive would cost four times as much as the original driving, we would have the following results:

## Gatun:

Cost of driving rivets accepted at the first driving, 1,582,400 rivets, at \$0.0507-----	\$80,227.68
Cost of driving 6 per cent, cut-outs allowed, 150,600 rivets, at \$0.2535-----	38,177.10
Cost of original driving, excess cut-outs, 765,000 rivets, at \$0.0507-----	38,785.50
Total admitted cost-----	157,190.28
Cost to cut out and redrive, excess claimed, 765,000 rivets, at \$0.2028-----	155,142.00
Total actual cost-----	312,332.28
Cost to drive, cut out and redrive all cut-outs, 915,600 rivets, at \$0.2535-----	232,104.60
Cost of driving rivets accepted at the first driving, 1,582,400 rivets, at \$0.0507-----	80,227.68
Total actual cost-----	312,332.28

## Pedro Miguel:

Cost of driving rivets accepted at the first driving, 982,400 rivets, at \$0.0507-----	49,807.68
Cost of driving 6 per cent, cut-outs allowed, 88,600 rivets, at \$0.2535-----	22,460.10
Cost of original driving, excess cut-outs, 40,500 rivets, at \$0.0507-----	20,533.50
Total admitted cost-----	92,801.28
Total admitted cost-----	92,801.28
Cost to cut out and redrive, excess claimed, 405,000 rivets, at \$0.2028-----	82,134.00
Total actual cost-----	174,935.28
Cost to drive, cut out, and redrive all cut-outs, 493,600 rivets, at \$0.2535-----	125,127.60
Cost of driving rivets accepted at the first driving, 982,400 rivets, at \$0.0507-----	49,807.68
Total actual cost-----	174,935.28

## Miraflores:

Cost of driving rivets accepted at the first driving, 1,353,200 rivets, at \$0.0507-----	68,607.24
Cost of driving 6 per cent, cut-outs allowed, 104,800 rivets, at \$0.2535-----	26,566.80
Cost of original driving, excess cut-outs, 288,000 rivets, at \$0.0507-----	14,601.60
Total admitted cost-----	109,775.64
Cost to cut out and redrive, excess claimed, 288,000 rivets, at \$0.2028-----	58,406.40
Total actual cost-----	168,182.04
Cost to drive, cut out, and redrive all cut-outs, 392,800 rivets, at \$0.2535-----	99,574.80
Cost of driving rivets accepted at the first driving, 1,353,200 rivets, at \$0.0507-----	68,607.24
Total actual cost-----	168,182.04



If we consolidate the above tables, we get the results shown in the tables below :

TABLE No. 1.

	Cost of driving rivets accepted at first driving.	Cost of driving, 6 per cent, cut-outs allowed.	Cost of original driving excess cut-outs.	Cost to cut-out and redrive, excess claimed.	Cost to drive cut-out and redrive all cut-outs.
Gatun.....	\$92,673.26	\$35,481.36	\$46,177.60	\$138,532.80	\$220,191.76
Pedro Miguel.....	57,727.76	20,874.16	24,090.10	72,270.30	117,234.56
Miraflores.....	81,057.18	24,690.88	15,608.50	46,825.50	87,124.88
Total.....	231,458.20	81,046.40	85,876.20	257,628.60	424,551.20

TABLE No. 2.

	Cost of driving rivets accepted at first driving.	Cost of driving, 6 per cent, cut-outs allowed.	Cost of original driving excess cut-outs.	Cost to cut-out and redrive, excess claimed.	Cost to drive cut-out and redrive all cut-outs.
Gatun.....	\$80,227.68	\$38,177.10	\$38,785.50	\$155,142.00	\$232,104.60
Pedro Miguel.....	49,807.68	22,460.10	20,333.50	82,134.00	125,127.60
Miraflores.....	68,607.24	26,566.80	14,601.60	58,406.40	99,574.80
Total.....	198,642.60	87,204.00	73,920.60	295,682.40	456,807.00

The table below shows totals of Tables 1 and 2, divided by 2:

	Cost of driving rivets accepted at first driving.	Cost of driving 6 per cent cut-outs allowed.	Cost of original driving, excess cut-outs.	Cost to cut-out and redrive, excess claimed.	Cost to drive cut-out and redrive all cut-outs.
Total, Table 1. ....	\$231,458.20	\$81,046.40	\$85,876.20	\$257,628.60	\$424,551.20
Total, Table 2.....	198,642.60	87,204.00	73,920.60	295,682.40	456,807.00
Grand total.....	430,100.80	168,250.40	159,796.80	553,311.00	881,358.20
Divided by 2.....	215,050.40	84,125.20	79,898.40	276,655.50	440,679.10

The table below analyzes Tables 1 and 2 of the Contractor by showing the cost of original driving, assuming no cut-outs, column 1; the cost of cutting out and redriving condemned rivets, column 2; and the per cent of each, respectively, columns 3 and 4:

TABLE No. 1.

	1	2	3	4
			<i>Per cent.</i>	<i>Per cent.</i>
Gatun.....	\$147,780.10	\$165,143.82	47.23	52.77
Pedro Miguel.....	86,936.40	87,925.92	49.72	50.28
Miraflores.....	102,957.20	65,343.66	61.18	38.82
Total.....	337,673.70	318,413.40	.....	.....

TABLE No. 2.

	1	2	3	4
			<i>Per cent.</i>	<i>Per cent.</i>
Gatun.....	\$127,155.60	\$185,683.68	47.65	59.35
Pedro Miguel.....	74,833.20	100,102.08	42.72	57.28
Miraflores.....	88,522.20	79,659.84	52.63	47.37
Total.....	290,511.00	365,445.60	.....	.....

The following tables show the average per cent of the cost of original driving and the average per cent of the cost of cutting out and re-driving:

Table 1:	<i>Per cent.</i>
Cost of original driving.....	51.77
Cost of cutting out and re-driving.....	48.23
Table 2:	
Cost of original driving.....	44.28
Cost of cutting out and re-driving.....	55.72

If the costs of the original driving, Tables 1 and 2, be added together and divided by 2, and the costs of cutting out and re-driving, Tables 1 and 2, be added together and divided by 2, it would show that the cost of original driving arrived at by this method was 47.88 per cent, and that the cost of cutting out and re-driving rivets was 52.12 per cent of the total.

The per cent of rush work at Miraflores was excluded in the rivet table prepared by the Contractor, page 79 of his claim, and is not included in the above analysis of such table.

Mr. Wolfel's testimony as to the meaning of this table is as follows (see pp. 237 and 238, vol. 7 of the evidence) :

Q. I want to ask you if you realize that an analysis of those figures and the application of them to actual conditions, assuming that the number of rivets that you base your calculation on was actually cut out, and assuming that it would take three times as long to cut out and redrive a rivet as to originally drive it, shows that two-thirds of the time spent in riveting and two-thirds of the money paid for riveting at Panama was in work on rivets that were condemned and subsequently cut out and redriven? Do you realize that that table means that?—A. (As amended May 13, 1915.) I wish to state that that is entirely correct, and I am fully aware of it.

However, I would rather see this put in a slightly different way, as the original driving, cutting out, and re-driving of rivets covers both the effective and wasted labor, and as the combination of the two might, to the reader who does not go thoroughly into this point, produce a very wrong impression. In judging the effect of cut-out rivets on the cost of the work I have always only considered the cost of cutting out and re-driving by itself. This represents the wasted labor, while the cost of the original driving covers the cost of putting the rivets into the work under the ideal condition, when there are no rivets cut out.

On this basis we get from the first part of the blue-print corrected table, on page 79 in the revised claim, the following results:

	<i>Cents.</i>
Total average cost of driving of rivets, per piece.....	11.45
Normal cost, including 6 per cent cut-outs, per piece.....	6.95
Cost of original driving, per piece.....	5.89

This would make the cost of the original driving 51.5 per cent of the total cost; the normal cost of driving rivets, including the 6 per cent cut-outs, 60.1 per cent of the total cost; the total waste in labor in cutting out, 48.5 per cent of the total cost; and the excess cost to the Contractor, 39.9 per cent of the total cost.



For Miraflores, which, in accordance with page 75 of the claim, is the basis of the calculations, these figures would be as follows:

Cost of original driving, 61.2 per cent of the total cost.

Normal cost of driving rivets, including the 6 per cent cut-offs, 72.2 per cent of the total cost.

Total waste in labor in cutting out, 38.8 per cent of the total cost.

Excess cost to the Contractor, 27.8 per cent of the total cost.

I believe that is the way it figures out from the table submitted.

The per cent of waste labor, Table 1 of the Contractor, is 39.2 per cent. The per cent of waste labor, Table 2 of the Contractor, is 45.1 per cent. The average per cent of waste labor on which claim is based, Tables 1 and 2, is 42 per cent. The total amount claimed to have been wasted in driving rivets at all three lock sites is \$276,655.50, not including rush work at Miraflores, and not including the per cent that would have to be added to cover transportation, liability, and insurance, nor anything for extra equipment.

The difficulties in riveting up, if the assumptions on which the tables are based represent the facts, did cause great delay in the performance of the work under the contract, and at least from one-third to one-half of the claim for rush work could be attributed to this cause. The extent to which the work was affected, as shown by this table, if the assumptions on which the computations are based should be taken as facts, shows that approximately \$400,000 was wasted in connection with the riveting up of these gates. This would represent nearly one-eighth of the entire expense of erection, exclusive of equipment and applying of the bitumastic enamel. It would mean that in the item of labor for riveting, not including rush work at Miraflores, 42 days in every 100 were wasted; that more than 4 hours out of every 10 was wasted; that the work of riveting should have been done with the same force and same equipment in 58 per cent of the actual time that it took to do it under the assumed conditions.

If the assumptions made in the preparation of this table are taken as representing the actual facts that existed, it would show a remarkable situation, existing for a remarkably long time. It would also show that the conditions which were affecting the number of rivets to be cut out were continuous, operating practically as a constant, inherent cause in the character of the work or the character of the workmanship done or required.

The first proposition to be considered is to determine, as nearly as practicable, the number of rivets that were cut out. The way the Contractor undertakes to establish this proposition is: First, by attempting to show the number of rivets that were shipped to the Isthmus to apply upon this contract, the amount of rivet rods and number of rivets that could be made from such rods at the average weight of the rivets paid for, and in this way to arrive at the total number of rivets used in connection with the contract. He then takes the number of field rivets that would be required in the gates, 5,730,000. He then allows 4 per cent for burnt and lost rivets, or 230,000, and 6 per cent, or 344,000, for those cut out under normal conditions. The rivets for spare parts are then added—157,652, and 261,450 that were transferred to Balboa leaves, sold to the Isthmian Canal Commission, or returned to the plants of the Contractor. The remaining rivets he treats as excess cut-outs and bases his claim,

so far as rivets are concerned, on the excess arrived at in this way. Second, by testimony of witnesses, giving their estimates of the per cent of rivets that were cut out. The first method is an attempt to raise a presumption as to the cut-outs by showing the number of rivets used to produce the necessary results. The second method is to raise a presumption as to the number of cut-outs by estimates made by witnesses who had personal knowledge of the conditions as they existed at the time the riveting was being done.

The evidence submitted to establish the number of rivets shipped to the Isthmus is the shipping lists of the Contractor. The total number of rivets of each diameter, the total of all rivets, and the total weight were as follows:

$\frac{3}{4}$ -inch	58,801
$\frac{7}{8}$ -inch	4,923,201
1-inch	1,939,959
$1\frac{1}{8}$ -inch	84,595
Total	7,006,556
Total weight	5,951,145

In addition to these rivets, 1,052,265 pounds of rivet rods were shipped to the Isthmus. The size, shipment number, order, date of shipment, and the number of pounds shipped are shown in the table below:

$\frac{3}{4}$ -inch rod:	Pounds.	Pounds.
Shipment No. 1, special 56, Nov. 26, 1912	10,000	
Shipment No. 4, special 56, Feb. 8, 1913	20,000	
		30,000
$\frac{7}{8}$ -inch rod:		
Shipment No. 2, field 127, Oct. 10, 1912	60,000	
Shipment No. 3, special 56, Dec. 26, 1912	60,000	
Shipment No. 5, special 56, Feb. 19, 1913	212,250	
Shipment No. 10, special 56, July 16, 1913	205,120	
		537,370
1-inch rod:		
Shipment No. 2, field 127, Oct. 10, 1912	30,000	
Shipment No. 2, special 156, Dec. 17, 1912	30,000	
Shipment No. 6, special 56, Feb. 24, 1913	208,890	
Shipment No. 7, special 56, June 2, 1913	40,000	
Shipment No. 8, special 56, June 18, 1913	50,000	
Shipment No. 11, special 56, July 23, 1913	51,320	
Shipment No. 13, special 56, Aug. 12, 1913	20,160	
		430,370
$1\frac{1}{8}$ -inch rod:		
Shipment No. 2, field 127, Oct. 10, 1912	6,000	
Shipment No. 2, special 56, Dec. 17, 1912	10,000	
Shipment No. 9, special 56, July 11, 1913	4,005	
Shipment No. 12, special 56, Aug. 19, 1913	31,200	
		51,205
		1,048,945
On field 127, the items are given in tons, and amount to 48 tons; the poundage of the 48 tons are shown to be 99,320; that would make a difference of		3,320
		1,052,265

The shipping lists furnished by the Contractor show the diameter and length of the rivets, weight of the rivets, number of rivets, car number, contract number, and the date of the shipment. The in-



spectors' shop reports have been examined, and it has been found that the data placed on the shipping lists correspond substantially with the inspectors' shop reports. It is not undertaken to say, however, that every shipment of rivets shown in the very large number of shipping lists has been checked with the inspector's reports, but enough of these lists have been examined and compared with the data found in the inspectors' shop books to satisfactorily show that the data contained in the shipping lists substantially correspond with like entries made by the Isthmian Canal Commission's inspectors in their original shop books.

Mr. Harry P. Fullem was shipping clerk for the Contractor from July, 1911, until the work was completed. His testimony is found in volume 20, pages 58 to 66. He produced the original shop books kept by him, showing the shipment of rivets under the various contracts. These shop books were examined and it is found that the entries contained in them as to the shipment of rivets correspond with the entries in the shipping lists produced by the Contractor. The evidence seems to establish the fact that rivets of the weight, and possibly of the number, as shown on page 342 of this report, were shipped. It also establishes the fact that rivet rods of the weight shown on page 343 of this report were shipped. (See blue print, vol. 29, list of rivets taken from shipping lists; also shipping lists referred to in this blue-print.)

All rivets are billed and paid for by weight. The transfers of rivets were accounted for by weight. The way in which the Contractor arrives at the number of rivets is by taking the number shown on the shipping lists and adding to this the number that could be made from the rivet rods shipped to the Isthmus, after allowing 3 per cent for waste and estimating the weight of the rivets made at the average weight of the rivets paid for. This computation would produce the following result:

The total number of rivets that appear to have been shipped, as shown on the shipping lists, is 7,006,556. The average weight of the rivets paid for was 0.86898. The amount of rivet rods shipped, when reduced by 3 per cent, was 1,020,700. At the average weight that was paid for the number of rivets shipped there could have been made from these rivet rods 1,174,600 rivets. This, added to the rivets shown on the shipping lists, would make 8,181,156 rivets to be accounted for. (See blue-print list of rivets, vol. 29, p. 1.)

The way in which the Contractor accounts for the rivets shipped to the Isthmus, claimed to have been made from the rivet rods, is as follows:

The actual number of rivets placed in the leaves was 5,730,000; the rivets for spare parts, 157,652. He claims to have transferred to Balboa leaves 41,840 pounds, to have sold to the Commission 81,869 pounds, to have returned to Pittsburgh 73,725 pounds, and to have returned to Pottstown 29,760 pounds, making a total of 227,194 pounds disposed of outside of those used in the lock gates.

The number of rivets transferred to Balboa leaves, sold to the Commission, and returned to Contractor's plants is found by dividing the number of pounds of such material by the average weight per rivet of the rivets paid for. This would show the number of rivets thus

disposed of 261,450 pounds. The number of rivets accounted for under this method of computation would be as follows:

Placed in 92 leaves	5, 730, 000
Rivets for spare parts	157, 652
Transferred to Balboa, sold to Commission, and returned to Contractor's plants	261, 450
Total	6, 149, 102
Excess	2, 032, 054

The rivets used in the work were paid for by weight. The rivet rods shipped to the Isthmus have been accounted for by weight. The rivets sold, transferred, or returned to the Contractor's plants have been accounted for by weight. The shipping lists show the weight as well as the number. The last thing performed in connection with the rivets prior to shipment to the Isthmus was to make a record of the weight shipped.

If the rivets and rivet material should be accounted for by weight, the account in pounds would be as follows:

Shipped:	Pounds.
Shown to have been shipped by shipping lists	5, 951, 145
Rods shipped, less 3 per cent for waste	1, 020, 700
Total weight appearing to have been shipped by shipping lists	6, 971, 845
Disposed of as follows:	
Placed in the 92 leaves and paid for	4, 979, 276
Weight of rivets for spare parts paid for	138, 677
Weight of rivets transferred to Balboa leaves	41, 840
Sold to Commission	81, 869
Returned to Pittsburgh	73, 725
Returned to Pottstown	29, 760
	5, 345, 147
Excess weight of rivets	1, 626, 698

If this excess weight should be divided by the number of excess rivets shown, it would show the average weight of the excess rivets to be 0.80052, which is considerably less than the average weight per rivet of all rivets paid for and placed in the leaves. If we divide this weight by the average weight per rivet paid for, 0.86898, it gives the number of excess rivets as 1,871,044.

The two methods of determining the number of excess rivets shipped show a difference of 161,010.

In determining the number of rivets that could be made from the rivet rods shipped, 3 per cent is allowed for waste. The rods were shipped in 14-foot lengths. This would allow about 5 inches waste on each rod and require all parts of rods, except this 5 inches, to be made into good rivets. This percentage is probably too low. It is not unreasonable to assume that the weight of waste and imperfect rivets would be nearer 8 per cent than 3 per cent. If 8 per cent should be taken as the waste in making rivets from the rivet rods, the actual weight of the rivets made from such rods would be 968,084 pounds. This added to the weight of the rivets shown to have been shipped by the shipping lists would make 5,951,145 pounds, which shows the actual shipment of rivet material, when made into



rivets, to be 6,919,229 pounds. Deduct the 5,345,147 pounds of rivets accounted for and it will leave 1,574,082 pounds of rivets as the excess. If this excess weight is divided by the average weight per rivet of all rivets placed in the 92 leaves and paid for, it will show 1,810,492 rivets as the excess to be accounted for as cut out, burnt, lost, or put into scrap.

There does not seem to be any reason why the average weight per rivet of the rivets that were cut out, burnt, lost, or scrapped and classed as excess by the Contractor, should be any less than the average weight per rivet of all rivets placed in the 92 leaves and paid for. If anything, it would be fair to assume that there was a greater per cent of the larger and longer rivets cut out, or at least included in this excess, than in the rivets that went into the leaves. The shipment of rivet rods to the Isthmus shows a shipment of 537,370 pounds of seven-eighths-inch rods, 30,000 pounds of three-fourths-inch rods, which would make the total of the smaller rivets 567,370 pounds. There were shipped of the 1-inch rods 430,370 pounds, and of the 1½-inch rods 51,205 pounds, or a total of 481,575 pounds. This is a much greater per cent in weight of the larger material than of the smaller material, and assuming that it was made into rivets it would indicate that the per cent of cut-outs in the larger rivets was greater than the per cent of cut-outs in the smaller rivets. The more material the rivets had to go through the greater the difficulty of bolting up with the small bolts and the more liability there would be for loose rivets. It is fair to assume, therefore, that a larger per cent of the longer and heavier rivets were cut out than of the shorter and lighter rivets. This would also indicate that the number of rivets to be classed as excess is probably smaller than as shown by the Contractor on blue-print list of rivets, volume 29 of the evidence. It is believed that a fair analysis of the evidence and the application of the assumptions as to waste in making the rivets out of the rivet rods and in accounting for the excess weight shown from the shipments, in the manner above given, justifies the conclusion that the maximum number of excess rivets to be accounted for as burnt, lost, cut out, or put into scrap unaccounted for, is about 1,810,492.

The way in which the Contractor accounts for the excess rivets is by allowing 4 per cent of the number of rivets in the finished leaves for rivets burned or lost. He then concedes 6 per cent for rivets cut out under normal inspection and charges all of the excess to the Commission in making up his claim. Even if 4 per cent should be taken as the maximum to be allowed for burnt and lost rivets this 4 per cent should be applied to the excess claimed, for the reason that whatever may have been the cause of driving so many rivets the percentage of burnt and lost rivets would be about the same. It would probably be greater as to the cut-outs than it would be as to the original driving, for the reason that there would be a great deal more area to cover in driving the cut-outs in proportion to the number of rivets to be driven than would be covered in driving the original rivets. The claim indicates an assumed abnormal condition as to the number of cut-out rivets and the percentage as to burnt and lost rivets should be increased to take care of this abnormal condition,



and instead of the percentage of burnt and lost rivets being based practically on normal conditions, or the total number of rivets required to be driven in the field, as is done in bridge work, it should be based upon practically the total number of rivets that were driven in the field, less the cut-outs conceded.

If the basis above should be taken as indicating the excess rivets shipped, and 344,000 representing the 6 per cent conceded cut-outs be taken from it, it would leave an excess of 1,466,492 as excess to be accounted for either as excess cut-outs or as rivets burnt, lost, or thrown into scrap as defective. Four per cent of this number, or 58,659, should be added to the 230,000 that the Contractor concedes would have been burnt and lost. This would make the burnt and lost rivets amount to 288,659. Two hundred and eighty-eight thousand six hundred and fifty-nine taken from 1,466,492 would leave for excess rivets still to be accounted for 1,177,731, as cut out, burnt, lost, or thrown into scrap as defective.

The Contractor claims that all of the rivets which can not be accounted for on the assumptions made in his claim, page 78, were cut out because of unreasonable inspection and the abnormal conditions under which he was required to do the work.

Before attempting to examine the evidence in detail as to the number of rivets that were cut out, such evidence as your committee has been able to obtain as to the disposition of scrap rivets or as to the probability that more than 4 per cent were burnt or lost or thrown into scrap as defective will be considered.

The Contractor was not able, from his records, to furnish any detail as to what disposition was made of the scrap rivets and scrap bolts, but such evidence as could be obtained from the examination of his books will now be considered. The evidence as to the probability of the number of cut-outs will also be considered, and from this evidence it will be determined whether or not it was more probable that a larger per cent of rivets were burnt and lost or thrown into scrap as defective than it is that such rivets were cut out as claimed by the Contractor.

Under field order 88 the Contractor shipped 2,478,082 pounds of fitting-up bolts. In addition to this he shipped 189,445 bolts, weight not given. At the average weight of the bolts shipped this would amount to about 160,000 pounds. Add 160,000 pounds to 2,478,082 pounds would make 2,638,082 pounds of fitting-up bolt material to be accounted for. As above shown, the total weight of rivets and rivet rods shipped to the Isthmus, as shown by the shipping lists, was 7,003,410 pounds. The total amount of this material that has been accounted for as placed in the 92 leaves and paid for, and in the spare parts as transferred to Balboa leaves, sold to the Commission and returned to Pittsburgh and Pottstown, is 5,345,147 pounds. This leaves the amount of rivet material to be accounted for, as scrap, 1,658,263 pounds. This added to the weight of the fitting-up bolts would make the total rivet and bolt material to be accounted for, as scrap rivets and fitting-up bolts, 4,296,345 pounds.

The records of the McClintic-Marshall Construction Co. vouchers 67258, 69982, and 69969, with lists attached, show bolts and rivets disposed of as follows:



	Pounds.
Sold to Jones & Laughlin-----	580, 300
Sold to Trimble-Mudge, consigned to Jones & Laughlin-----	850, 500
Sold to C. Dreifus, consigned to Jones & Laughlin-----	137, 800
Bolts and nuts returned to Rankin for rethreading-----	577, 977
New bolts returned to Rankin-----	36, 950

This makes a total of 2,183,527 pounds of Panama scrap rivets and Panama fitting-up bolts accounted for. This would leave 2,112,818 pounds to be accounted for.

Two hundred and twenty thousand four hundred pounds of miscellaneous scrap was sold to Mr. Max Solomon, but from the records it could not be told whether any part of this material was scrap rivets and bolts or not. All of the other scrap in the list attached to voucher 67258 is described.

In a letter from Mr. Sterrett, dated April 1, 1915, in reply to a letter from Mr. B. F. Harrah, a member of the Commission, dated March 29, 1915, relative to credit of \$1,637.38 in special No. 56, he states:

13. Special 56, a credit of \$1,637.38, is for rivet rounds shipped to Baltimore to be used on the Panama work, but on account of missing the boat was forwarded to Pottstown and charged against that plant and credited to the Panama job. Material and rivet stock here should be one item, as they both are for rivet rounds. (See par. 13, letter referred to above, vol. 26.)

Shipping list No. 20910, shipment 2, special 56, dated December 17, 1912, was for 10,000 pounds of 1½-inch by 14-foot rivet rods and 30,000 pounds of 1-inch by 14-foot rivet rods to be shipped by the Munson Steamship Line, of Baltimore, Md., a total of 40,000 pounds. Shipping list No. 20994, shipment No. 3, special 56, dated December 26, 1912, was for a shipment of 60,000 pounds of seven-eighths inch rivet rods to be shipped by the Munson Steamship Line, Baltimore, Md. These were the only shipments of rivet rods via Baltimore, Md., except a shipment of 99,320 pounds, shipping list No. 20101, shipment No. 2, dated October 10, 1912, and charged to field order No. 127.

It is probable that this is the material that is referred to in the statement of Mr. Sterrett above quoted. This accounts for 100,000 pounds of rivet rods claimed to have been shipped as shown by the shipping list, and it would seem from this that 100,000 pounds of these rivet rods shown to have been shipped by the shipping list were never delivered to the Isthmus. This would reduce the amount of rivet material to be accounted for as scrap, as shown on page 345, from 1,658,263 to 1,558,263 pounds.

It is not possible to check the scrap account of the McClintic-Marshall Construction Co. in such a way as to determine with any certainty the number of pounds of scrap rivets that were returned from the Isthmus and sold. For a list of the bolts and the pounds of fitting-up bolts see Exhibit No. 27.

The daily work reports of the Contractor have been examined. These work reports purport to show, under the various contracts, the number of rivets driven day by day and the total number driven under any particular contract at the end of any particular day. The last one of these work reports showing the completion of the work under each contract was blue printed by the Contractor and is found in Exhibit No. 27. From these reports it appears that rivets required

and reported driven under the various contracts were at a cost as follows:

Contract.	Number required.	Place.	Number rivets reported.	Cost.	Actual cost per rivet.
4857½	157,000	Gatun.....	183,485	\$14,224.71	\$0.09075
4861	270,000	do.....	324,167	28,159.68	.10129
4859	270,000	do.....	323,572	38,667.46	.14327
4855-A	271,000	do.....	335,148	30,126.18	.11116
4855	271,000	do.....	334,473	28,371.15	.10169
4851-A	270,000	do.....	230,136	28,778.73	.10658
4851	270,000	do.....	333,433	27,201.21	.10075
4847	540,000	do.....	617,558	55,612.69	.10298
4845	187,500	do.....	198,088	17,620.14	.03397
4845	187,500	Pedro Miguel.....	227,649	17,631.06	.09403
4849	282,500	do.....	332,855	28,762.33	.10181
4849-A	282,500	do.....	303,889	24,819.04	.08782
4853	282,500	do.....	360,751	31,646.21	.11202
4853-A	282,500	do.....	340,766	28,556.23	.10108
4857	157,500	do.....	183,471	17,196.06	.10913
4857	157,500	Miraflores.....	173,629	16,742.91	.10630
4859	270,000	do.....	288,197	21,492.95	.07960
4861	270,000	do.....	289,013	20,879.09	.07732
4863	270,000	do.....	301,186	25,428.45	.09118
4863-A	270,000	do.....	289,572	24,443.43	.09053
4865	287,000	do.....	318,060	27,773.39	.09677
4867	225,000	do.....	249,115	20,969.40	.09319
Total.....			6,641,213	575,125.50	.....

The total number of rivets required at the various lock sites and the total number that is reported to have been driven from these work reports is as follows:

	Total number reported.	Total number required.	Excess reported.	Per cent of excess.
Gatun.....	2,980,000	2,508,000	472,000	18.81
Pedro Miguel.....	1,749,381	1,476,000	273,381	18.49
Miraflores.....	1,911,772	1,746,000	164,299	9.39
Total.....	6,639,740	5,730,000	909,740	15.88

The table below shows the per cent reported in excess of the number required on each contract:

	Contract.	Per cent.		Contract.	Per cent.
Gatun.....	4857½	16.869	Pedro Miguel.....	4849-A	7.568
Do.....	4861	20.062	Do.....	4853	27.7
Do.....	4859	19.84	Do.....	4853-A	20.625
Do.....	4855-A	23.67	Do.....	4857	14.422
Do.....	4855	23.436	Miraflores.....	4857	9.655
Do.....	4851-A	22.272	Do.....	4859	6.739
Do.....	4851	23.49	Do.....	4861	7.042
Do.....	4847	14.362	Do.....	4863	12.254
Do.....	4845	5.6522	Do.....	4863-A	7.299
Pedro Miguel.....	4845	21.407	Do.....	4865	10.822
Do.....	4849	17.82	Do.....	4867	10.717

The average percentage of reported excess at the different locks is as follows:

	Per cent.
Gatun.....	18.822
Pedro Miguel.....	18.49
Miraflores.....	9.39



The Contractor was unable to furnish any record showing that the cut-outs had been counted. Mr. John E. Hess, the Contractor's foreman, who took charge of the work at Gatun in October, 1911, testified that he gave instructions to the rivet boss to deduct the rivets that were cut out from the total number of rivets that were driven. He asked this question (see p. 48, vol. 17, of the testimony):

Q. In determining the number of rivets driven in a day, did you do it by an actual count of the rivets?—A. Yes, sir; the riveting boss would count the rivets.

Q. How would he count them; would he count them on the leaf, or by the number of rivets that had been turned over to his boy?—A. Well, he would count the rivets, how many rivets each gang drove, after the cut-outs; that is, after they were cut out and redriven.

Q. Then, you think your daily reports simply represent the number of rivets that were actually driven and accepted?—A. Yes, sir.

Q. Was that the way you intended to get up those daily reports?—A. No, sir.

Q. Well, do you know that they do not do that at all?—A. How is that?

Q. Do you know that those daily reports do not reflect that situation?—A. That is the way mine were turned in.

Q. That is the way yours were turned in?—A. Yes, sir.

Q. Well, do you know that the daily reports that have been turned in here as showing the total number of rivets that were driven show that you drove about 909,744 more rivets than you had holes to drive them in?—A. Well, it was not done at Gatun between the time I went there until I left; I know that there was not but very few more rivets turned in than what was driven.

Q. Very few more turned in than were driven? When did you leave there?—A. I left there in September.

Q. What year?—A. 1912.

Q. At the time you left there all of the rivets in the four upper guard gates had been driven, had they?—A. All except the sidewalk and sidewalk brackets.

Q. How many rivets would there be in the sidewalk and sidewalk brackets?

Mr. STERRETT. A very small number; I do not know; I suppose in those guard gates, in the leaf, there were somewhere around 45,000 rivets; they were small gates. The 77-foot gates would run about 60,000 to a leaf. Now, in the sidewalk there would be about 500.

Mr. HESS. I would not say you would find more rivets in that leaf now, because the whole skeleton was driven before I came there and one-fifth of the shell. Now, if there were more rivets reported on that set of gates than what was in there, it was reported before I went there.

Mr. STERRETT. I do not suppose Mr. Hess drove 400,000 rivets while he was down there. Did you, Mr. Hess?

Mr. HESS. Oh, yes; I guess there was more than that driven; I drove the skeleton, you see, of all the gates on the upper level.

By Judge HARRAH:

Q. Here is a report that appears to have been made by Mr. Jewel dated June, 1912. In that report he shows that the total number of rivets driven for leaves 37 to 40 was 195,758. The total number of rivets that are shown to have been driven in this cost sheet here [indicating] on these four leaves, 37 to 40, inclusive, is 187,500. So at the time that report was made you had reported as having driven and accepted about 9,000 more rivets than it appears there were rivets to be driven in that work down there at that time.—A. Well, now, understand me, when I went there that skeleton was driven and one-fifth of the sheeting. Now, how many rivets more was reported than was driven before I came there I can not say; but when I found out that men were reporting more than they drove, I told the foremen to count the rivets that they drove, and then when they cut them out, to deduct that many rivets off of them in the next day and make them drive those rivets.

Q. Do you know whether your foremen did that?—A. Well, from what the foremen said to me, and from what I counted, I thought they were keeping a pretty close tab on it.

Q. In going over these records, I do not remember having seen any entries in those daily reports showing a deduction for rivets that were cut out.—A. Well, but if a man drives 300 rivets to-day and has to cut 50 of them out, the

next day if he drives 350 rivets and has to drive these 50 over, he only gets credited with 300 for that day; he loses these 50 rivets the day after.

Q. Well, have you any record that will show that? Did you have any reports that would show how many he was losing?—A. Well, the foreman would have the book, and I would ask him how many rivets these gangs drove and he would hand me the book.

Q. What was done with those books?—A. The foreman would just hand it in, and it would go to the timekeeper.

Q. What was done with those books?—A. Well, I do not know what became of those records.

The percentage of rivets reported driven in excess of the number required on the upper guard gates at Gatun, contract 4845, page 352 of this report, was 5.6522 per cent. The percentage on contract 4847, which was for the two upper gates and two middle gates at Gatun, was 14.362 per cent. These were the gates on which Mr. Hess was doing the principal part of the riveting, about which he testified. It will be noted from an examination of the percentages given that the lowest percentage of the reported excess is on contract 4845 at Gatun. While this is true, it is also noted that the cost of doing the riveting at Gatun on this contract, in proportion to the number of rivets driven, was almost as great as on any other contract. (See p. 351 of this report.) This would indicate that Mr. Hess was probably attempting to report on these contracts only the accepted rivets, as he states in his testimony.

Mr. William J. Galloway, who was in charge of riveting and bolting up in the east chamber at Gatun for the McClintic-Marshall Construction Co., testified that it was his duty to make reports as to the character and quality of work that was being performed under him. (See p. 75 of vol. 23 of the testimony.) He stated that he made reports in writing daily. He was shown the blank of the contractor headed "Daily report of rivets and reaming," and he stated that that was not the kind of a blank upon which he was required to report. His further testimony in connection with the way in which he made his reports and as to the number of cut-outs is found on pages 75 to 82, inclusive. The gist of his testimony is that he did not keep any record or have any count made so as to enable him to tell about what per cent of rivets were being cut out. (See p. 78 of testimony above referred to.) He thinks there were about 40 or 45 per cent of the rivets cut out. For easy reference the remainder of his testimony in connection with the number of rivets cut out and the way in which he kept his records, pages 78 to 82, is quoted below:

Q. Did you ever from your observation and knowledge of conditions as they existed there on the work that was under you undertake to make an estimate of the number of rivets that were cut out?—A. Well, I have occasionally thought, from observation and seeing the number of rivets marked in different plates and on different leaves throughout the job—estimated it at between 40 and 45 per cent.

Q. Between 40 and 45 per cent. Do you mean, then, that there would be at least two rivets out of every five that would be marked for you to cut out?—A. Yes; right close on that.

Q. Does that cover the whole surface of the gate or only particular parts?—A. That would cover the most of the gate, I believe. I am safe in saying that would cover the whole gate.

Q. How much longer would it take to cut out a rivet than to drive a rivet?—A. That is puzzling. I could not answer that question, because there are some rivets that you could knock out in a short time and not back them out; others would take a day or a week, just according to how they were backed in the sheathing.



Q. Well, do you think half of the time of your laborers down there was spent in cutting out rivets and redriving them?—A. No, sir; not quite half, I do not think; that would be 50 per cent.

Q. You do not think it was half?—A. Not half the time.

Q. Well, you never considered the cut-outs were of sufficient importance for you at any time to make an accurate estimate of the number that were cut out?—A. That would be pretty near an utter impossibility to do, because when an inspector would come and cut out rivets and those rivets would be redriven again, probably there would be half of them again to cut out, or others that they had loosened up in the redriving.

Q. Could you not count those, the same as the rivets originally driven?—A. That could be done, I have no doubt.

Q. You did not undertake to do it?—A. No, sir; the job was too large and there were too many cut-outs.

Q. All you did, then, was to turn in the number of rivets you had driven?—A. The number of rivets that were driven were turned in by me; at least, they were put on the reports; and sometimes I signed them, but as a general rule the foreman under me would sign them.

Q. Then all you would know would be that you would take the count of the foremen as to the number of rivets which were driven that day, and turn that in as the number of rivets driven by your men?—A. Yes, sir.

Mr. STERRETT. Pardon me. You mean accepted rivets, do you not?

Mr. GALLOWAY. Yes, sir; all the rivets put down were supposed to be accepted rivets.

Mr. STERRETT. That is not what Judge Harrah asked.

By Judge HARRAH:

Q. Well—"supposed to be"—do you know whether they were or not?—A. Well, I could not say.

Q. Well, in order for them to be accepted rivets, you would have to count the number of cut-outs, would you not?—A. No; we never counted the cut-out rivets; they would just give the number of good rivets driven.

Q. And then you would rely on the rivet inspector to take out the cut-outs that were made, and not report them as good rivets?—A. We never kept any reports on the cut-outs.

Q. Then all you know about the number of cut-outs is just an estimate, pure and simple?—A. An estimate; that is all I know about cut-outs.

Q. And you do not know, as a matter of fact, whether there were 20 per cent, or 25 or 40 per cent of cut-outs?—A. Well, my estimation on the work is—I believe I can safely say that there were about 40 per cent of rivets cut out.

Q. Then you think that about half of your time was spent in cutting out rivets and redriving them?—A. Not quite half the time, but pretty close on it.

Q. Well, why was it that, if such a condition as that existed, you never took any steps to ascertain accurately just what you were doing?—A. Well, we were not called upon to make any count on rivets cut out; in fact, we did not have any time to count the rivets cut out.

Q. And yet you say that you were expected to report only rivets that were accepted; and how could you do that unless you counted the rivets that were cut out?—A. Well, these rivets that were counted, or supposed to be counted, were turned in each day by the foremen; they were supposed to be rivets driven and accepted by the Government.

Q. The Government inspector did not inspect the rivets driven every day, did he?—A. Pretty near; yes, sir.

Q. Is it not a fact that he would wait two or three days before he would come around?—A. Sometimes; yes. But, as a general rule, when we had driven a panel up, or half a panel, just according to where the inspector was, he went over those rivets.

Q. Suppose he went over them the last thing in the evening and marked, say, 50 out of 250, to be cut out; then, in reporting on those, would your rivet foreman report only 200 rivets, or the actual number driven that day?—A. That I could not say. As a general rule they took the count of these rivets about—well, past 3 in the afternoon; all the reports had to be made after that—before half past 4 in the evening.

Q. The reports that I have here as to rivets driven show that you drove 909,740 more rivets in those gates than you had holes. Now, how do you account for that, unless they were reporting each day the number of rivets they drove,

regardless of cut-outs?—A. Well, as a general rule, on any kind of ironwork, the rivets are away overreported.

Q. Away overreported?—A. Yes, sir; I have always found it that way. I think it is 10 per cent.

Q. Well, if it was 10 per cent overreported, there would still be about 400,000 that would be driven more than you had holes, allowing 10 per cent for over-reporting.—A. Well, it might run just a little higher there, since that job was so big.

Q. Well, would not the fact that the job was big, and the fact that you were working on it from day to day, tend to reduce the errors rather than to increase them in reporting?—A. Well, ordinarily I suppose it would.

The only thing that can be done is to estimate the number of cut-outs in the best possible manner. That this is the case is admitted by the Contractor in his brief (see p. 112).

From May 12, 1912, until the completion of the work, daily work reports were made at Miraflores of the riveting by Contractor. These reports show the cost of cutting out and re-driving daily, the cost of riveting, the number of gangs, number of gangs cutting out and re-driving, and number of gangs picking up, also the number of rivets that were driven. There is always a notation opposite the gangs reported as cutting out that no count was made. The totals shown by these reports at Miraflores are as follows:

(1) Total cost of riveting, cutting out, and re-driving, also picking up -----	\$79, 592. 50
(2) Total cost of cutting out and re-driving -----	12, 453. 89
(3) Total cost of picking up -----	184. 44
(4) Cost of riveting -----	66, 954. 17
(5) Total number of gangs -----	5, 882
(6) Total number of gangs cutting out and re-driving -----	1, 010
(7) Total number of gangs picking up -----	18
(8) Total rivets driven -----	843. 195

Rivets cut out: No count made.

Under the assumption of the Contractor, on page 79 of his claim, it cost 5.89 cents per rivet to originally drive rivets and three times as much to cut them out and re-drive them. On this basis the Contractor could have cut out and re-driven as many rivets as 17.67 cents is contained times in \$12,453.89, the amount shown to have been expended for cutting out and re-driving. On this basis he could have cut out 70,400 rivets. On the assumption that it cost 5.07 cents per rivet to originally drive a rivet, and four times as much to cut it out and re-drive it, he could have cut out and re-driven as many rivets as 20.28 cents is contained times in \$12,453.89, or 61,400 rivets. If the two results are combined and divided by 2, as is done by the Contractor in arriving at the excess cost of driving the rivets, 65,900 could have been cut out.

The reports cover about 44 per cent of the total amount of rivets that were driven at Miraflores. If this percentage is applied in determining the cut-outs as to the other rivets driven at Miraflores not included in these special reports it would show that there were about 149,700 rivets cut out at Miraflores.

The total number of rivets reported to have been driven by the work reports at Miraflores was 1,911,772. This would show an excess above the number of rivets required at Miraflores of 165,772.

Twelve thousand four hundred and fifty-three dollars and eighty-nine cents shown to have been expended for cutting out and re-driving



ing rivets at Miraflores applies to about 44 per cent of the rivets driven in the gates. If the same ratio obtained as to cutting out on the remainder of the work at Miraflores, the cost of cutting out and re-driving at Miraflores would be about \$28,300.

If we should assume that considerably more rivets were cut out on the first part of the work at Miraflores than on the last part of the work covered by the work reports, the excess cost would not be more than \$30,000 or \$35,000 at the outside. The claim of the Contractor, as stated on pages 75 and 79, that he spent \$52,600 for excess riveting at Miraflores is not sustained. If the records of the Contractor are to be accepted as indicating the actual cost of cutting out rivets at Miraflores, the number of rivets cut out at that place could not have been as great as is shown in his claim, even assuming that rivets could have been cut out as cheaply as they could have been originally driven. If we assume that the rivets could have been cut out as cheaply as they could have been originally driven, and that the Contractor's expenditures for cutting out rivets prior to the time that he kept a detail account of such expenditures, he could not have cut out more than 180,000 rivets. It does not seem that, exclusive of salaries and special 21, more than \$30,000 or \$35,000 could have been expended in cutting out rivets at Miraflores, including rush work; neither does it seem possible from the evidence that the number of rivets claimed to have been cut out at Miraflores could have been cut out by the Contractor with the expenditures made.

Upon the basis of the probable actual cost of cutting out rivets for the entire work at Miraflores arrived at from the work reports in the manner shown above, the per cent of rivets cut out at Miraflores was between 8 and 12 per cent.

The estimated number of rivets adopted by your committee as having been cut out at Miraflores will be the number reported to have been driven in excess of the number required, or 165,772.

In adopting this number as representing the probable cut-outs, the evidence relative to reporting only accepted rivets and relative to overreporting has been taken into consideration. The check made from the actual cost, as derived from the work reports of the Contractor, indicates that it is probable that the over reporting is very nearly equal to the cut-outs, at least there was no counting of the cut-outs for the purpose of reporting them during the time that they were being driven by separate gangs, but in the early part of the work rivets that were subsequently cut out could have been, and probably were, reported as good, and went into the account in such a manner as to indicate that there were considerably more rivets driven than there were holes to put them in. If rivets were reported as driven, and subsequently cut out, and the rivets driven to take the place of the cut-out rivets reported as rivets driven, the final result would be that the reports would show a considerably larger number of rivets driven than there were holes to put them in, and this probably took place, in the early part of the work, at least, at Miraflores, and in a great deal of the work at Gatun and Pedro Miguel, notwithstanding the statement of the Contractor that only accepted rivets were reported.

From all the evidence, however, the number indicated is believed to be as fair an estimate as can be made. If a normal is established



at Miraflores, and the allowance is made under this normal, it will not be material or necessary to even estimate the number of cut-outs at Pedro Miguel or at Gatun, except for the purposes of fixing the responsibility for the excess cost over and above the normal.

The percentages of cut-outs given in the testimony are reasonably accurately reflected by the testimony quoted by the Contractor in his brief, pages 112 and 113, as follows:

Mr. Courter, superintendent for the Contractor at Pedro Miguel, volume 16, page 64, 30 per cent.

Mr. Connor, inspector for the Commission at Pedro Miguel, volume 35, page 12, 8 per cent, which does not include the rivets cut out by the Contractor's inspectors.

Mr. Hess, superintendent for the Contractor at Gatun, volume 17, page 33, one-third of the rivets driven.

Mr. Galloway, rivet boss for the Contractor at Gatun, volume 23, page 81, 40 per cent.

Mr. Dumville, local inspector in charge at Gatun for the Commission, volume 32, page 96. "It might have run as high as 40 per cent, can not tell; however, the percentage was high."

Mr. Wright, superintendent for the Contractor at Miraflores, volume 32, page 129, 20 to 22 per cent.

Mr. Howe, local inspector in charge at Miraflores for the Commission, volume 32, page 72, 20 per cent.

Mr. Guynn, chief inspector for the Commission on the Isthmus, volume 32, pages 173 and 174, declined to make an estimate of the percentage of cut-outs, but says there was an unusually large percentage of rivets cut out and re-driven.

Mr. Goldmark, in volume 8, page 141, was unable to give a reasonable estimate of the number of cut-outs, but on page 112 says that he knows that on some gates there were an awful lot of cut-outs.

Mr. Goldmark further refers in volume 9, testimony of Mr. Sterrett, page 40, to the enormous number of condemnations that occurred.

Notwithstanding these estimates, it is believed that such a condition as would be indicated by them did not exist for a period of two and one-half years. It is almost certain that the estimates at Miraflores, made by Mr. Wright and Mr. Howe, are much in excess of the number of rivets that could have been cut out. It is also to be noted that during all this period of time covering the work at the three lock sites, and during which it is claimed so many rivets were being cut out, it is remarkable that the Contractor has no record of the actual count, showing for any period of time the number of rivets that were cut out.

In his testimony taken at the Isthmus, reported in volume 32, page 116, Mr. Dumville testified as follows:

Q. Was any record kept by you or by anyone else on the work in regard to the number of cut-out rivets, either total or for any period of the work?—A. The only record I ever kept was once Mr. Goldmark asked me verbally to give him as near as I could the number of rivets that the average gangs would drive in a given number of days. I can not say how many days' period was taken, but the letter is on record, because I mailed a letter to Mr. Goldmark for his information. The inspectors picked out two gangs that were under their inspection and we kept track of these two gangs for a period of a week or more, I think. I do not know how many days; and then I took the average that these gangs drove, and the average of what the different inspectors reported to me as having been cut out behind these different gangs, and I submitted all that in a letter to Mr. Goldmark, and that was the only record in writing that was kept, to my knowledge, at Gatun.

Q. Did you keep a copy of that, or do you recollect the figures?—A. No, sir. A copy of that letter was in Mr. Guynn's files at the time I closed the office at Gatun. All of the data that I had there was put into boxes and shipped to



Culebra; that is, to Mr. Goldmark's office. Mr. Guynn was away on vacation at the time.

Mr. SMITH. About when was that report made out?

Mr. DUMVILLE. It was somewhere in 1913; I can not say just when. It was at the time, I think, when Mr. Guynn was away on his second vacation.

Mr. Guynn, chief inspector on the Isthmus, testified, volume 32, pages 171 and 172, as follows:

Q. Have you any information—was any data kept in regard to one leaf or at any one point in regard to the percentage of cut-outs?—A. At one time there was, for 10 days' duration.

Q. Whereabouts?—A. Gatun.

Q. Was that kept on the work as a whole or on certain leaves?—A. Just during the riveting of the upper and lower locks for the 10 days. I was on vacation at the time, but the information was requested by the designing engineer, and he detailed his inspector or inspectors to get the information.

Q. So that Mr. Goldmark has that information?—A. He should have, as Mr. Dumville informed me that he forwarded it to him.

Q. Do you know what that information was?—A. I can not remember just exactly all of it. I think perhaps the local inspector at Gatun, who is present, possibly remembers this letter. [Reads from his report:]

"During the month of January, 1914, Mr. Goldmark requested this office to furnish data as to the average number of rivets driven on lock gates each day per gang and the number condemned by the inspectors."

The following report was submitted:

"Taking the actual count behind two gangs by each of the inspectors for a period of 10 days, showed the average number of rivets to be 212 per gang. On the end reaction castings 1,270 rivets were driven and submitted for inspection, the inspector condemning 12. On the sheathing in gates, upper lock, the inspector condemned on an average of about 17 in each panel (about 1,300 rivets per panel) on the sheathing in the gates in lower locks, out of a total of 948 rivets (the total number driven by five gangs in one day) the inspector condemned 21."

This testimony of Mr. Guynn indicates that it could have hardly been possible for the percentage of cut-out rivets at the various lock sites to have run anywhere near the estimates that have been made by the witnesses and the estimates contained in the claim of the Contractor.

The location of the rivets in the leaves and the number of such rivets is shown in the list prepared by Mr. Hammer February 21, 1913. This list is as follows:

TABLE 1.—Number of field rivets required for one leaf of mitering lock gates, Panama Canal, W. O. 23444.

Location of field rivets in—	Height of leaf.							
	47 feet 4 inches.		54 feet 8 inches.	66 feet.	77 feet.	77 feet 10 inches.	79 feet.	82 feet.
	Upper guard.	Lower guard.						
Skeleton.....	8,220	8,250	9,610	11,710	13,690	13,710	14,490	14,510
Upstream sheathing....	15,300	15,300	19,460	23,000	28,450	28,580	29,090	29,830
Downstream sheathing.	14,560	14,570	16,560	19,910	25,520	23,620	25,180	25,400
Reaction castings and wedges.....	1,080	1,080	1,270	1,540	1,810	1,840	1,860	1,930
Total number for one leaf.....	39,160	39,200	46,900	56,160	67,470	67,750	70,620	71,670

The number of field rivets given under: 1—Skeleton includes the rivets that connect the intercostals, vertical frames, and diaphragms to the girders.

The number of leaves of the different heights is as follows:

	Number.
47 feet 4 inches :	
Upper guard-----	4
Lower guard-----	8
54 feet 8 inches-----	8
66 feet-----	4
77 feet-----	40
77 feet 10 inches-----	8
79 feet-----	16
82 feet-----	4

This shows that about 20 per cent of the rivets were in the skeleton.

Under paragraph 32 of the agreement of August 10, 1910, the Contractor obtained permission to ream the connections between all diaphragms and girders full size in the shop to iron templets.

On August 16, 1915, volume 22 of the testimony, Mr. W. M. Sterrett testified as follows (see pp. 75 and 76, vol. 22):

Judge HARRAH. Mr. Sterrett, referring to paragraph 32 of the modifications provided for in the agreement of August 8, 1910, please state whether or not you had the same difficulty in driving the rivets in these connections that you had in the skin.

Mr. STERRETT. No, sir.

Judge HARRAH. Did you have any more than the ordinary cut-outs in these connections?

Mr. STERRETT. I think not.

It will be noted from this testimony that there was no trouble with the interior connections, and that there was no more than the ordinary cut-outs in the skeleton. The estimates of the witnesses, however, appear to apply to the entire number of rivets driven in the field, which would include the 20 per cent that were driven in the skeleton.

The contractor's claim is also based upon the assumption that the percentage of cut-outs applies to all the rivets in the field. If the 20 per cent of rivets in the skeleton were eliminated, it would very materially increase the percentage of rivets estimated to be cut out in the sheathing.

It is probable that a greater percentage of rivets were lost or burnt or returned to scrap unaccounted for than is admitted by the Contractor.

The testimony does show that an unusually large number of rivets were cut out, and after charging the contractor with his part of the responsibility for the cut-outs due to his failure to present his claim when the specifications were changed to the smaller holes, and allowing a reasonable percentage for excess cut-outs at Miraflores, it is believed that in arriving at a normal for Miraflores \$12,000 should be deducted to cover excess expenditures due to the cutting out of an abnormally large number of rivets. (For reference to the testimony, see p. 333 of this report, and for report showing the total number of gangs driving rivets at Miraflores and the gangs cutting out from November, 1912, to November, 1913, see Exhibit 9, vol. 18 of the testimony.)

In view of the fact that the claim has been presented and is being considered on the basis of establishing a normal price for doing the work at Miraflores and applying this normal price to Gatun and Pedro Miguel, it is not considered necessary to go into the details of riveting at Gatun and Pedro Miguel, except in so far as such



details may tend to determine to what extent the Contractor should be held responsible for expenditures in excess of the normal expenditures under ordinary and usual conditions, such as he had a right to presume would prevail under the terms of the contract.

In considering the general conditions under which the work was performed and the general character of the inspection with a view to fixing the responsibility for the excess expenditures over the normal, the general character of the rivet inspection at Gatun and Pedro Miguel will be taken into consideration.

#### CLAIM FOR EXCESS GRINDING.

The way in which the Contractor arrives at the amount of this claim is by including it as one of the items to be deducted in establishing the normal, as shown on page 75 of the original claim, as follows:

(f) *Excess grinding, three-fourths of one-third of \$119,900, \$29,966.*

On page 81 of the Contractor's claim he states what this claim consists of and the way in which the amount of it is arrived at at Miraflores, as follows:

(f) *Excess grinding.*—The total cost of machine work at Miraflores amounted to \$119,900. One-third of this was spent in grinding the end plates, and the nickel-steel bearing plates. Three-fourths of this grinding was unnecessary, and either contrary to previous agreement or contrary to the contract requirements.

The Contractor therefore claims three-fourths of one-third of \$119,900, or \$29,966.

The basis for this claim is found in the statement of the Contractor, page 49 of his claim, as follows:

That they insisted upon having the work executed contrary to the spirit of a previous agreement, and also on having work done distinctly not called for in the specifications.

On page 50 of his claim the Contractor states what he considers as the unreasonable demands that were made upon him in connection with the claim for excess grinding, as follows:

(b) The nickel-steel bearing plates had been ground at the shops with the utmost precision to a practically perfect alignment. The specifications are entirely clear as to the method that should be pursued to adjust the same in the field, no grinding being called for whatever. Contrary to these requirements, we had to grind them in the field so that feelers four one-thousands of an inch in thickness could not be inserted between these plates when the gates were closed, although no such limitation was established on the plans or in the specifications. This again caused additional delay and expense.

(c) As it was proven that the planing of the ends of the leaves was not feasible and not necessary, this planing had been waived, with the proviso that the end reaction castings be made in one-story height against two-story heights called for, and that any high spots caused by the riveting on these end plates in the shop or in the field be removed by grinding. A heavy canvas water-stop was also provided between the end reaction castings and the end plates. The omission of the end planing was the main saving the Contractor counted on when he agreed to absorb a good deal of additional expense he had to incur on account of the necessary changes. Contrary to the spirit of this agreement, he had to grind the end plates to perfect planes in the field, causing a tremendous expense and delay.

On pages 53, 54, 55, and 56 of the claim the Contractor undertakes to detail some of the important facts in connection with the claim for excess grinding.

The contention of the Contractor, briefly stated, is that under paragraph 16 of the agreement of August 8, 1910, the planing of the end plates in the field was waived, and that notwithstanding this waiver he was required to do grinding and furnish a surface by means of grinding much better than could have possibly been obtained by the planing. This claim for grinding refers to the grinding on nickel-steel bearing plates on the ends of the leaves and the planing of the end plates. The paragraphs in the original specifications referring to the planing of the ends are as follows:

20. The vertical ends of the leaf as shown in drawings Nos. 5028 and 5030 will be constructed of a flat plate and two bent plates connecting the former to the sheathing. This end plate when securely riveted in place must, during erection, be planed over its entire surface to a true plane so as to insure a good contact for the bearing of the end reaction castings. The edges of the end plate and of the sheathing connected to the bent plates must be calked the full height of the leaf before the end reaction castings are erected in place.

Paragraph 121 of the original specifications, in so far as it relates to planing, reads as follows:

121. \* \* \* The vertical ends of the leaves must be kept straight from the top to the bottom, so that the bearing plates on the quoin and miter posts may be truly in line and make proper contact. After the structural work is completely assembled and riveted up, the end plates shall be planed to a true surface. \* \* \*

In the table of corrections, page 4 of the contract, it is provided:

Page 24, section 121, line 7: "The end plate shall be planed to a smooth surface." This refers to the plate 24 inches wide, at the extreme end of structural work. The outer surface of this plate is to be finished so that it shall form an exact plane for the entire height of the leaf. The original thickness of the plate provided must be sufficient to allow this planing without reducing final thickness of the plate below three-fourths of an inch.

The way in which the nickel-steel bearing plates were to be adjusted is provided for in paragraph 123 of the specifications, as follows:

123. The reaction bearings in the hollow quoins and at the ends of the gates must be adjusted with the utmost care, so as to be in perfect contact throughout their entire height. The fixed castings will be set by the Commission, so that the bottom of their recesses will form a practically flat and continuous surface for the attachment of the nickel-steel plates. The fixed bearing plates in the hollow quoin shall be adjusted in a correct position by the bolts and set screws provided for the purpose and the pouring of the babbitt shall be done as specified below. This adjustment shall be made before the gates are erected on their pintles.

When the castings on the leaves are bolted to the planed end plates of the structural work the bottoms of the recesses must be as truly in line as possible, and the variation from a true plane must in no case exceed the amount of adjustment provided for in the plans.

The nickel-steel bearing plates on the leaves shall be brought to their proper position by the bolts and screws shown on the plans. The adjustment may be made with gates open or closed, preferably the latter, but the fit of the bearings must be tested before babbitting by closing the two leaves to an exact miter, and the bolts must be used to correct any inaccuracies thus made apparent. The babbitt metal shall be poured after reopening the gates, the bolts and screws remaining in place. It shall be poured through holes close enough together to give sound metal and result in a complete filling of the space between the castings and the plates, but in any case the pouring holes shall not be more than 4 feet apart. After pouring, the joints between the steel castings and the edges of the bearing plates shall be calked and made tight, and all open bolt holes and pouring holes shall be carefully filled with neat cement, which shall be finished to the exact outline of the steel.



Paragraph 35 of the agreement of August 8, 1910, provides that (see p. 10 of the original claim)—

It has been decided to increase the thickness of babbitt between the nickel-steel bearing plates and end reaction castings from one-half inch to five-eighths inch.

The testimony on which the Contractor relies in support of this claim is referred to in his brief, pages 117 to 128, inclusive.

The estimate for end planing made by the McClintic-Marshall Construction Co., in the preparation of their bid, under item 1, was \$2 a ton, or 10 cents per hundredweight. (See Exhibit 1 in the testimony of Mr. Marshall, vol. 11.) The amount of material paid for under item 1 was 106,963.039 pounds. At 10 cents per hundredweight the estimate for the end planing would amount to \$106,963.

It is claimed by the Contractor that the principal consideration moving to him for the changes provided in the agreement of August 8, 1910, was the stipulation contained in paragraph 16 of that agreement, which provides that—

Permission is granted of making the end reaction castings one story in height only; this is done for the reason that the McClintic-Marshall Construction Co. expects to demonstrate during the assembling of some of the gates in their yard that the work can be done so near correct that any minor adjustment can be made by means of babbitting between the end reaction castings and the nickel-steel bearing plates and the planing of the end plates done at the shop instead of in the field. (See p. 5 of Appendix to original claim.)

Mr. Pendergrass, under date of April 30, 1915, prepared an estimate to show how the various provisions contained in the agreement of August 8, 1910, would affect the cost of doing the work in the shop and in the field.

From this estimate of Mr. Pendergrass it appears that \$94,323 was added to the shop and field cost on account of the changes provided for in the agreement of August 8, 1910. It appears that the Contractor saved by the changes provided for \$58,323. If we take the amount saved from the extra shop and field labor, it would leave \$36,000. This statement also indicates that the Commission saved \$53,444. If we should add the amount of this saving to the amount of extra labor cost the Contractor had to incur by reason of the changes, it would make a total of \$89,444 as the consideration moving to the Commission for the changes provided for in the agreement of August 8, 1910. (For the details of this estimate, see vol. 27 of the evidence.)

If the end planing should have been done in accordance with the original estimate made by Mr. Marshall, it would have cost the Contractor, as shown on page 370 of this report, \$106,963. It is not claimed by the Contractor that he was to be relieved entirely of all work on the end plates by reason of the waiving of the end planing, as provided for in paragraph 16 of the agreement of August 8, 1910. It was understood, though not expressed in that agreement, that he was to grind off the high spots on the end plates.

After the specifications relating to planing and the modifications of the specifications in the contract quoted above in this report had been determined upon, pages 106, 107, and 108, Mr. Wolfel's testimony, volume 7, and it had been shown that these provisions went to all the bidders before the bids were received, testimony was given

by Mr. Wolfel and Mr. Goldmark as follows (see pp. 109 to 121, inclusive, vol. 7):

Mr. WOLFEL. Paragraph 16 of the supplemental agreement of August 8, 1910, reads as follows:

"Permission is granted of making the end reaction castings one story in height only; this is done for the reason that the McClintic-Marshall Construction Co. expects to demonstrate during the assembling of some of the gates in their yard that the work can be done so near correct that any minor adjustment can be made by means of babbitting between the end reaction castings and the nickel-steel bearing plates, and the planing of the end plates done at the shop instead of in the field."

Now, our claim is that we did demonstrate to Mr. Goldmark and to Mr. Hammer, after the first leaves were assembled at the shop, that the gates built up so straight that with the modification of making the end reaction castings of only one story height this planing was unnecessary.

Q. State what you did to demonstrate that to Mr. Goldmark?—A. Can I first state about Mr. Hammer?

Q. Yes.—A. Mr. Goldmark was not there when the first leaves were assembled in the yard, but Mr. Hammer was there and went over the leaves very carefully. The ends were measured up, and Mr. Hammer was satisfied that those ends were built up sufficiently straight and that the planing could finally be waived.

And furthermore, after some discussion in our drawing room, he also waived the planing of these plates at the shop. This must have happened somewhere around or before March 10, 1911, because for the built-up leaves in the shop one set of end plates was ordered on September 30, 1910; the balance of the end plates for the 54-foot 8-inch leaves was ordered March 10, 1911, without any provision for planing whatever.

The order was exactly as given here on page 18 of our claim.

As a matter of fact, the end plates were ordered for the 47-foot 4-inch and 54-foot 8-inch leaves thirteen-sixteenths inch thick; for the 66-foot leaves, three-fourths inch thick; and for all the leaves from 77 to 82 feet, inclusive, eleven-sixteenths inch; the idea being to comply with three-fourths inch as called for in the contract in the leaf of medium height, varying the other end plates to correspond with the change of thickness in the skin on the downstream side, in order to keep the back of the end plates in the same position for all the leaves. Examination will show the same thickness of material is specified as part of the finished leaves.

Q. Go back a moment and state what you did to demonstrate this to Mr. Goldmark.—A. Well, I am not quite clear in my remembrance of that, but going over the matter with some of our shop men the other day they remembered, as well as I did, that when Mr. Goldmark came to Rankin again the plumb bobs were put on the end of these leaves and the dimensions checked up.

Q. To what height had the leaves been built up at that time?—A. I can not tell positively. Probably five or six stories.

Mr. GOLDMARK. They were built in sections; not to the whole height.

Judge HARRAH. I know that, but I want to know in how many sections.

Mr. GOLDMARK. The whole gate. They built several sections in different parts of the yard, so that we could see the actual gate at one time; but not one stuck right on top of the other like a house.

Judge HARRAH. That is what I mean; they were not stuck one right on top of the other?

Mr. GOLDMARK. They could not do it; but the whole gate was there in places.

By Judge HARRAH:

Q. That is what I wanted to get; you may go ahead.—A. I naturally supposed then that Mr. Goldmark would be satisfied with the arrangement made, because our plans clearly show that there was no provision whatever made for planing those end plates, and I know that Mr. Hammer waived it.

Q. You say here that you did demonstrate it to Mr. Goldmark?—A. I did. And at that time I thought I could positively state that Mr. Goldmark agreed to it. As I said before, I am a little lazy on that, and as Mr. Goldmark disputes it I can not contradict him. But Mr. Hammer acted in his place, and Mr. Hammer certainly did waive that end planing.

Mr. MARSHALL. Would it be permissible for me to make a remark now?

Judge HARRAH. Yes; I will first swear you.



(Mr. Marshall was then duly sworn by Judge Harrah, that the statements he should make in connection with this investigation and the testimony he should give would be the truth, the whole truth, and nothing but the truth.)

Mr. MARSHALL. Supplementing Mr. Wolfel's remarks in reference to your question, we actually assembled at our shop one of these leaves, complete, in three sections; and having assembled them, we were able to demonstrate by the actual figures whether or not it was necessary to do this planing; and after this leaf was assembled the measurements demonstrated that the planing was unnecessary, because the assembling came so true that it was practically perfect.

Judge HARRAH. Was Mr. Goldmark there when you took those measurements?

Mr. MARSHALL. I believe he was.

Judge HARRAH. Have you those measurements in your files now?

Mr. MARSHALL. Not that I know of; but I expect Mr. Hammer had them.

Judge HARRAH. Well, you made the measurements, did you not?

Mr. MARSHALL. No, sir; Mr. Hammer made the measurements in connection with our men.

Judge HARRAH. Did he furnish you copies of his measurements?

Mr. MARSHALL. I believe he did; my recollection is having seen those measurements.

Judge HARRAH. Did you discuss those measurements with Mr. Goldmark?

Mr. MARSHALL. I think they were discussed with Mr. Goldmark.

Judge HARRAH. Well, did you discuss them with Mr. Goldmark?

Mr. MARSHALL. I do not know that I did personally; no.

Judge HARRAH. That is all.

Mr. MARSHALL. I believe that Mr. Goldmark will confirm the statement that those measurements were so accurate that he believed it was unnecessary to do any planing.

Judge HARRAH. What about that, Mr. Goldmark?

Mr. GOLDMARK. As I recollect it, when I got there the end plate was covered up, because the castings had been put on the ends of the gates, so that if these measurements were made of the end plate before the castings were put on, that was done before I got there. The castings were all on. Is that right, Mr. Wolfel?

Mr. WOLFEL. I can not tell.

Mr. GOLDMARK. I am very sure that the castings were all on before I got there. The leaves were certainly very true and good, as was shown in a letter that I wrote to Col. Hodges at the time.

Mr. WOLFEL. May I say a word? I tried to bring out before that that matter apparently was settled by Mr. Hammer. I will correct my statement in this book, because at that time I thought Mr. Goldmark was the one that settled it. It must have been settled by Mr. Hammer, because he ordered the other plates on March 10, 1911, before Mr. Goldmark got there.

Now, what later on took place between Mr. Hammer and Mr. Goldmark, or between Mr. Goldmark and ourselves, I can not swear to. But whatever happened, Mr. Hammer acted in the Commission's stead, and there is no question that he always understood that those end plates had not to be planed. This is also brought out in that letter that Mr. Price wrote, quoted in the appendix.

Judge HARRAH. Let Mr. Goldmark proceed with his statement.

Mr. GOLDMARK. I would like to say a word more. That I do not seem to remember much of anything about that end plate coming up at that time. The rivet holes were discussed, as you remember, for days and days.

Mr. MARSHALL. Yes.

Mr. GOLDMARK. But I honestly can not remember that the end-plate question was brought up with me. As Mr. Wolfel says, it may have been settled with Mr. Hammer; but I remember that the gates, as a whole, were very true and plumb, as I wrote to Col. Hodges, to Pittsburgh or New York, within a day or two; but as to the end plates I have no recollection.

Judge HARRAH. Did anyone show you any measurements that had been taken in connection with the end plates, to show whether or not they were true and built up straight to such an extent that planing would seem to be unnecessary?

Mr. GOLDMARK. I have absolutely no recollection of that question coming up. I have thought it over a good deal during the last six months, and I have looked over correspondence, but I can find nothing. It may have been that the matter

was brought up with me, but I can not recollect that that question came up at that time.

Mr. WOLFEL. May I ask Mr. Goldmark a question?

Judge HARRAH. Yes.

Mr. WOLFEL. Mr. Goldmark, have you any recollection of telling me that high spots could be taken off by grinding, but to have a few low spots would not make any difference?

Mr. GOLDMARK. I said that over and over again on the Isthmus, but I have no recollection of saying it to you or that that question came up.

Mr. WOLFEL. You did not say it in the yards when we were looking over these leaves?

Mr. GOLDMARK. I may have, but I can not remember. I have searched my memory and can not remember saying anything on the plate question during that visit at Pittsburgh. I may have done so, but I have no notes of it and can not seem to remember.

Mr. WOLFEL. I have no notes of it; but at that time it seemed to me that you said that the high spots could be taken off by grinding, and the low spots would not make any difference.

Mr. GOLDMARK. I have always said low spots do not make any difference, because the castings will extend over them. You will find over the low spot——

Mr. WOLFEL (interposing). Did you not understand that this end planing was waived?

Mr. GOLDMARK. No; I never understood it; and I have no reports from Mr. Hammer about this matter.

Mr. WOLFEL. Does not this order for the end plates show you that the planing was waived?

Mr. GOLDMARK. It looks so; but I did not know what planing you had ordered up in Pittsburgh. It looks so to me from that; and I have no doubt that you had that in your mind; but as I say, personally I have no recollection, nor was it reported to me by Mr. Hammer.

Mr. WOLFEL. Of course, we can not help that; but this was all gone over in detail, and those dimensions were settled by Mr. Hammer himself to come near the modification in W. O. 23444 and at the same time kept their distance constantly.

Mr. GOLDMARK. I have been over that plan, and those distances do check from end to end of the gates.

Mr. WOLFEL. And they do not give you three-fourths inch in that one case, and they certainly make no allowance for planing.

Mr. GOLDMARK. Geometrically, that is entirely right; and I have no doubt of that order. I do not doubt it at all; but it was not in my correspondence.

Mr. WOLFEL. Well, if those plates were to be planed there would have to be an order for it.

Mr. GOLDMARK. Yes.

Mr. WOLFEL. And there is no record of it here.

By Judge HARRAH:

Q. Did the drawings, approved by Mr. Hammer, show these thicknesses for the plates when ordered?—A. The drawings approved by Mr. Hammer show these thicknesses for the plates when ordered.

Q. Had the question as to the change in the thicknesses of the plates indicated in the specifications been discussed with Mr. Hammer before the drawings were made?—A. Absolutely. I remember the day just when Mr. Hammer settled on those thicknesses himself, on the second floor of our drawing room, in the presence of Mr. Pendergrass, I think right near Mr. Winterbottom's table; that is clear in my mind.

Judge HARRAH. Now, I want to ask Mr. Goldmark a question: Were you advised of these changes in the thicknesses of the plates at the time they took place?

Mr. GOLDMARK. We received these detailed drawings at about that time, but that is the only way; I was not told by letter or by word of mouth, as I recollect.

Judge HARRAH. Did these detailed drawings indicate the thickness?

Mr. GOLDMARK. I do not know; I think they did. But they were very voluminous, and I must confess we paid very little attention to them on the Isthmus. They were not checked by us—by me or anybody. They were filed and used in the erection; and the inspector had a set; but it was a multitudinous detail, and after the drawing was once approved by Mr. Hammer that generally



settled it. In fact, it was far too late after we received the drawing to make any changes.

Mr. STERRETT. Did not Mr. Goldmark just previously state here that he checked over the drawings and found they were correct?

Judge HARRAH. I understand that was since this claim came up.

Mr. GOLDMARK. That was since this claim came out; I think Mr. Price and I went over them to see as to that little difference in the thickness of the plates to correspond with the skin thickness—whether that statement is correct, and the statement is correct.

Judge HARRAH. Let me ask Mr. Price one question: First, I will swear him. (Mr. Price was duly sworn according to law.)

Judge HARRAH (continuing). Mr. Price, look at page 18 of the Appendix to the claim. Have you examined the drawings with a view of determining whether or not the drawings as approved called for material for the 47-foot 4-inch and 54-foot 8-inch leaves to be thirteen-sixteenths inch, the 66-foot leaves to be three-fourths inch thick, and for all leaves from 77 to 82 feet, inclusive, to be eleven-sixteenths inch thick?

Mr. PRICE. I have not gone over that thoroughly enough to answer that.

Judge HARRAH. Have you gone over it at all?

Mr. PRICE. I have gone over some of them.

Judge HARRAH. Do you find any of them to agree with that statement?

Mr. PRICE. All of them that I have gone over agree with it.

Judge HARRAH. That is enough.

Mr. WOLFEL. Can we introduce a letter written by Mr. Price as evidence that confirms our claim about the planing being waived?

Judge HARRAH. You may introduce any evidence that you have on that point.

Mr. WOLFEL. I wish to submit a report furnished us by Mr. Hammer that Mr. Price made to him, as I gather, some time in February, 1912. The copy had no date on it, but the whole occurrence was at that time. After talking about some defects in the work, in the third paragraph of this letter he states:

"Bent plates: This member, which has never been entirely satisfactory, owing to its construction, which makes it difficult to fabricate and check, is open to severe criticisms. A number of the  $\frac{1}{8}$ -inch holes have been reamed 1 inch by mistake, as reported February 20. Many of the countersunk rivets do not fill the countersink and many are clipped below the surface of the end and bent plates. The planed edge which takes the thrust of the sheathing is in many cases thoroughly planed, and the milled ends are not satisfactory in many instances.

"Paragraphs 20 and 21 of the original specifications call for the entire surface of end plates to be planed to a true surface after erection. This was modified by Mr. Goldmark August 8, 1910, to plane in the shop instead of in the field, and modified later to allow the end plates to be fabricated and accepted without planing, provided the work proved to be satisfactory. Taking into consideration the modification of the original contract, the shop should make special efforts to get this member satisfactory."

(The letter last referred to was marked "Exhibit 31, Wolfel.")

Judge HARRAH. Now, that part of the letter is introduced, as I understand it, to show Mr. Price's understanding that the end planing had been waived?

Mr. WOLFEL. That is the idea.

Judge HARRAH. If it should turn out that the castings had been attached to the ends at the time of Mr. Goldmark's arrival there, would you want that statement to stand?

Mr. WOLFEL. As I told you, it is from memory; I can not tell; I do not know whether the castings were attached to any of the leaves or all of the leaves. If the castings were attached, then I am mistaken.

Judge HARRAH. The plumbing could not have been done?

Mr. WOLFEL. The plumbing could not have been done if the castings were on.

Mr. GOLDMARK. I would like to say that I think myself the plumbing was done, but—

Mr. WOLFEL (interposing). You know, Judge Harrah, it has never entered my mind for a minute that it would be disputed that the planing was waived, as Mr. Price's letter shows. I never expected for a minute that there would be the slightest question that the planing had been finally waived—and that planing was waived. Now, whether Mr. Goldmark, personally, or Mr. Hammer waived it, I do not know. If I have made a statement that Mr. Goldmark disputes—he says he never waived it—that is all I can say. I do not want



anything on the record to show that I or Mr. Goldmark dispute each other. I am as liable to be mistaken as anybody else.

Mr. GOLDMARK. May I say a word?

Judge HARRAH. Yes.

Mr. GOLDMARK. I will say that I was sent for at that time. I came to the States on my annual leave, which had been long postponed from the previous year. I was in Mississippi on business, and I was sent for to straighten out some questions of the inspecting force, rather than any question of the end plates, or anything of that kind. That was why Maj. Boggs came to telegraph me to hurry here and went out with me.

The recollection of Mr. Goldmark as to the end planing, and as to the grinding done as a substitute for end planing, is given in his report, volume 1, pages 86 to 98, inclusive. In his testimony taken at Washington May 12 to 17, 1915, volume 8, pages 17 to 21, he corrects certain statements made in his report. He further testifies relative to the waiving of the end planing and his understanding of the matter, pages 172 to 178 of his testimony, volume 8. Further testimony in connection with the waiving of this end planing and as to the conversation that was had with Mr. Goldmark and Mr. Hammer in relation to waiving the end planing is found in volume 15, pages 18 to 29, inclusive. For easy reference the testimony referred to above is quoted below:

Finishing of end plates, volume 1, pages 86 to 98:

The plates referred to form the outer surface of the ends of the riveted structural frames. They are 24 inches wide and extend the full height of the leaf at both the quoin and miter ends. Their total area is considerable, being about 25,000 square feet for all the gates.

The reaction castings, where they bear against these plates, have surfaces planed in the shop, and it was intended from the start that the surfaces of the plates should be such as to be in close contact with the castings. This was deemed necessary when the design was first worked out—that this should be practically a metal-to-metal contact, such as prevails between two planed surfaces. The purpose of this was to avoid excessive pressure at any point, to keep the castings from riding on a few high points, and to hinder any springing or backward or forward motion of the castings as the water pressure against the gates increased and decreased in the filling of the locks. It was also thought that the water-tightness would be increased by tight joints well painted. This contact of planed surfaces between each of the castings and the end plate was an integral part of the original design, and its importance was borne in mind at all stages until the final completion of the work. I should have deemed it inadvisable at any stage to make any changes which did not insure such contact, and as a matter of fact I never did recommend or authorize any change that would conflict with this requirement.

Section 20, page 11, of the specifications, circular 576, embodies this requirement. It reads as follows:

“The vertical ends of the leaf as shown in drawings Nos. 5028 and 5030 will be constructed of a flat plate and two bent plates, connecting the former to the sheathing. This end plate when securely riveted in place must during erection be planed over its entire surface to a true plane, so as to insure a good contact for the bearing of the end reaction castings. The edges of the end plate and of the sheathing connected to the bent plates must be calked the full height of the leaf before the end reaction castings are erected in place.”

It will be noted that it requires planing of the end plate after it is riveted in place.

The matter is further referred to in section 121, page 24, which says:

“The vertical ends of the leaves must be kept straight from the top to the bottom, so that the bearing plates on the quoin and miter posts may be truly in line and make proper contact. After the structural work is completely assembled and riveted up the end plates shall be planed to a true surface.”

Section 123, page 24, also says:

“When the castings on the leaves are bolted to the planed end plates of the structural work the bottoms of the recesses must be as truly in line as possible, and the variation from a true plane must in no case exceed the amount of adjustment provided for in the plans.”



The method by which this planing was to be done was carefully considered as early as 1908 and discussed with at least one prospective bidder. It was also gone into with several bidders in May, 1908, when the writer was in Washington 10 days for the purpose of answering questions regarding the meaning of any part of the specifications. Prior to that time, May 21, an appendix to circular 576 was issued to prospective bidders, which reads as follows:

"Page 24, section 121, line 7: 'The end plate shall be planed to a smooth surface.' This refers to the plate 24 inches wide at the extreme end of structural work. The outer surface of this plate is to be finished so that it shall form an exact plane for the entire height of the leaf. The original thickness of the plate provided must be sufficient to allow this planing without reducing final thickness of the plate below three-fourths of an inch.

The matter was further referred to in a letter from the chief quartermaster to the general purchasing officer of April 11, 1910 (file 84-C-81, Part II), which says:

"Section 121: 'After the structural work is completely assembled and riveted up, the end plates shall be planed to a true surface.' The end plates referred to are 24 inches wide and extend from the top to the bottom of the leaves. It is necessary that a true plane surface should be provided for the attachment of the end reaction castings, the abutting surfaces of which are also to be planed.

"It is believed that better results can be obtained by planing these plates after riveting than by any other procedure and that there will be no practical difficulty in so doing. This matter was taken up in detail with one of the leading bridge and ship works in the United States some time ago who, in fact, suggested the above method.

"In a general way, it would involve fastening guides for a small shaper or milling machine to the structural sides of the gate leaf, using some of the bolt holes for the purpose."

The last paragraph of this letter describes the method of doing the planing which the writer had in mind. A perfectly practical machine of this type was designed for the use of the Contractor in 1912 or 1913 by the Commission's engineers at his request and expense, but was never actually built.

When discussing the detailed construction of the gates with Mr. Paul L. Wolfel, the Contractor's chief engineer, at Pittsburgh, in July, 1910, he suggested that the planed surface on the end plates required by the specifications would be obtained equally well by planing these plates in the shop before shipments, and omitting the field planing. He also argued that an exactly true plane for the whole height of the gate could in no case be obtained, owing to differences of temperature. He offered to show that after the first gate was erected in the field, the plates as planed in the shop and riveted in the field would form a surface equal or better than would be obtained in case the planing had been done in the field.

No definite arrangement or agreement was made either in writing or by word of mouth by which the planing was waived, and the planing was to be done in the shop only as an experiment subject to future approval as to the balance of the work.

The only change made at that time was to permit the Contractor to build the reaction castings in one-story heights, instead of two-story heights as shown in the plans. This was agreed to by me as it made it easier to get good castings, and also to get a good bearing on the planed plates in case of slight errors. This change is given in section 16 of the modifications made August 8, 1910—page 5 of the Appendix.

I do not remember that the matter was further referred to at the time, nor do I remember any instructions to Mr. Hammer either verbally or in writing. None have been found in our records.

The matter was not further brought to my attention during the autumn or winter of 1910-11, either by letters from the Contractors or by Mr. Hammer in his reports or letters.

It is claimed by the Contractors, page 31, also page 53, that the specifications were modified by me, August 8, 1910, to permit planing in the shop, and "modified later to allow the end plates to be fabricated and accepted without planing." This last modification, if it was made, must have been made by Mr. Hammer or one of his inspectors. I have no direct record of this having been done, and do not recollect ever hearing of it until I read these "claims."

From Mr. Price's letter to Mr. Hammer, reprinted on page 28 of the "claims," and on record in our Pittsburg files, it would appear that he believed that such



a modification had been authorized by Mr. Hammer. However, the shop planing never appeared on the shop plans, where all directions for workmanship are stated.

According to Mr. Price, the shop planing would have been useless if it had been done before the end plate was riveted to the "bent plates" in the shop, as such riveting would inevitably have drawn the plates out of a plane. The shop planing would also have been of little use, even if the end plates had been planed in the shop after riveting them to the bent plate, as the combined thickness of the end and bent plates necessarily varied in different cases. There would have been an offset at the horizontal joints where successive sections of the end plates met, and even with very perfect planing of the girders and very accurate erection the surface of the end plates would not have been satisfactory.

Furthermore, as was abundantly proved during erection, the field riveting of the A frames to the end plates pulled them out of shape, so that hand riveting was resorted to to reduce the trouble from this cause.

I am entirely satisfied that Mr. Hammer did well, if he did so, in recommending to the Contractor to abandon shop planing. If, in addition to this, he told them that planing of these plates in the field would be waived because the plates were straight and smooth before manufacture (see Wolfel's letter, p. 17), he made a mistake, because he could not possibly tell what the surface of these plates would be after they were erected in the field and riveted up. Owing to possible errors in the length of the girders, in their setting, and other errors in erection, differences in the thickness of the combined end and bent plates, changes due to riveting, etc., there was no one who could at that time foresee what would be the condition of those plates after erection.

As a matter of fact, a decision on this point, abandoning an important clause in the specifications entirely, was far beyond the scope of Mr. Hammer's duties as laid down in his letter of instructions, August 8, 1910. (File 84-C-81, Pt. III.)

April 11, 1911, and some days after that, I spent at the Pittsburgh shops of McClintic-Marshall, and made a second visit on May 8, 1911, again staying a few days. At that time one leaf 54 feet 8 inches was almost wholly erected. My recollection is that the reaction castings had been fastened to the end plates at that time, so that the latter could not be examined. At any rate, I have no recollection of this matter having been discussed at that time. Mr. Wolfel says, page 17 of his letter:

"We did demonstrate to Mr. Goldmark and Mr. Hammer, after the first leaves were assembled at the shop, that the gates built up so straight that with the modification of making the end reaction castings of only one story height this planing was unnecessary."

All I can say is that I have no recollection of this at all.

Mr. Wolfel also states, on page 17, that he proved to me that field planing would have been ineffective on account of the effect of the sun, and the claim has also been made by others that this temperature effect made it quite absurd to plane these ends.

The point has also been made that in asking for a true plane on the end plates I had asked for an impossibility, etc. As to this, it is quite true that all surfaces on these gates, including the end plates, vary with temperature. As far as the ends are concerned, numerous careful measurements on the finished gates have shown that during the dry season, when the sun is hottest, the top girder is not over one-fourth inch longer than the bottom girder of a 77-foot gate at 2 o'clock of an exceptionally bright day. Precise measurements on the bearing plates at the miter ends also showed that at that time a straight wire connecting the center of bearings at the top and bottom did not deviate from the bearing at any point more than a few thousandths of an inch. The larger figures of three-fourths to seven-eighths inch referred to by Mr. E. K. Morse on page 56 refers to a possible movement of the leaf up and down stream and was in any event an overestimate.

If it had been attempted to plane these ends by building an (p. 93) absolutely rigid planing machine entirely apart from the leaf, there would undoubtedly have been difficulty from temperature, unless the work had been done entirely between midnight and 7 or 8 a. m. This would have been an extremely expensive machine to build, and I do not think this type of planer was ever seriously considered by anyone. By using a small machine fastened to the leaf by bolts the planing would have been done in sections, the machine gradually advancing down or up the leaf and producing a true and satisfactory bearing for each casting. Such a machine was outlined in letter of the chief



quartermaster to the general purchasing officer, April 11, 1910, mentioned above. The machine subsequently designed for the Contractor by Mr. Dye, one of the Commission's engineers, was of the same type. In the light of our present experience, I believe, much time, trouble, and money would have been saved if the Commission had insisted upon this method.

At the request of the Contractor's manager of erection he was subsequently permitted to substitute for the planing specified, which had never been waived, a different method which he thought would be more advantageous to his company.

On September 20, 1911, during the writer's absence from the Isthmus, Col. Hodges, assistant chief engineer, wrote to Mr. Jewel, referring to the specifications, and asked him to plane the end plates of the 54-foot 8-inch guard gates at Gatun, which had then reached the stage where this was necessary. (See letter of Sept. 20, 1911 file 84-C-81, Pt. VI.) By letter of September 25, 1911, same file, Col. Hodges wrote to me, then in the United States, asking whether any agreement, verbal or written existed, waiving this planing, as claimed by Jewel. I can not find record of any reply, but the letter may have reached New York after my departure. It shows that Col. Hodges, who kept in very close touch with this work, did not know of any agreement to waive planing.

Mr. Jewel, September 21, 1911 (file 17, Pt. 11), answers Col. Hodges's letter. His letter in full is as follows:

"GATUN, CANAL ZONE, September 21, 1911.

"Col. H. F. HODGES,

*"Assistant Chief Engineer, Culcra, Canal Zone.*

"SIR: I have to acknowledge receipt of your letter of September 20, in regard to the necessity for having the ends of lock gates form a true plane before erecting any reaction castings. We believe our surfaces are in perfect condition in this respect, and will have your chief inspector satisfy himself upon this point before any reaction castings are attached.

"Respectfully,

"McCLINTIC-MARSHALL CONSTRUCTION Co.,  
"L. L. JEWEL, *Manager of Erection.*"

It appears that at this time the Contractor's manager fully acknowledged their liability in this respect.

I can not find any record as to the manner in which, or the exact date at which, the arrangement was made for finishing the end plates by grinding with emery wheels instead of planing. I am inclined to think this was early in October, 1911, just before my return from the United States. The understanding was, at all times, that the result obtained should be the same as by planing and that the change was a concession to the Contractor and made at his request. The work was done by small machines handled by one or two men, and the character of the work depended largely on their skill. At times the amount of grinding was largely increased by the fact that the men employed did not use good judgment and ground too much in certain places, requiring much extra labor to bring the whole surface to a proper condition. The amount of work to be done was the subject of contention from the beginning to the end of the work. My instructions were that it should be limited to obtain a good bearing for each individual casting, without reference to successive castings. The claim that we required the entire surface from the top to the bottom of the leaf to be ground to a true plane is, of course, not true. Furthermore, it is not true that the entire surface of the several panels had to be made a true plane.

It should also be pointed out that the reference to the high polish required, and the claims that the surfaces were made to shine like mirrors are misleading. When grinding with fine emery wheels the production of a fine, smooth surface is a necessary result. It was never asked for by us. All that was insisted is clearly stated in the description of the methods of erection given on page 80 of the annual report:

"In order to insure a good bearing between the castings and the end plate on the gate frame, the latter are carefully ground with emery wheels. No attempt is made to obtain an absolutely true plane for the whole height of the leaf, as minor errors are readily corrected by the adjustment of the bearing plates. The deviation from a true plane is, however, very small. The grinding has for its purpose the obtaining of good contact between the individual castings, which are a panel in height, and the end plates. An exact contact is insisted upon along the outer edges of each casting, and also opposite the reaction diaphragms, but small depressions at other parts of the surface are permitted."



The statement made by Mr. Wolfel in page 19 of his letter does not, I believe, represent the facts exactly. It is quite true that the surfaces were tested by using a straightedge and feelers, this being the only way feasible. It is not, I believe true that they were obliged to grind these plates so that a feeler one sixty-fourth inch thick could not be inserted between the straightedge and the plate in any direction. The requirement was enforced only as outlined above along the edges of the plate and along a vertical line 8 inches from the downstream face. Nor was the feeler uniformly one sixty-fourth inch thick. This was the degree of accuracy aimed at, but many plates were passed in which the limit was very much greater. Further, as to the surface away from the edges, no special requirement was made; in fact, depressions of any amount were permitted.

It has been claimed that this was an unreasonable requirement, and furthermore that the exact tolerance permitted should have been stated in the specifications. With regard to this, I would say that the standard aimed at was to secure about as good a bearing surface as we should have got if planing had been used according to the letter of the contract instead of grinding to suit the Contractor's preference.

As to the tolerance permitted, it should be noted that planing within one sixty-fourth inch on a surface of 2 by 5 feet can not in any way be considered close or difficult work. In the case of the bearing plates bought under circular 513, all plates showing errors exceeding 0.015 inch, or about one sixty-fourth inch, were sent to Gogona shops for replaning. See letters, file 17, Part I, June 2, June 7, June 29, June 30, and July 11, 1911. While these were bearing surfaces requiring special smoothness, the limit of 0.015 inch is by no means a close one. All that was required in the case of the end plates was a degree of accuracy corresponding to the castings which bore on the plates. No specific tolerance was ever given for these castings, but no difficulty was encountered in making them entirely satisfactory. It has always seemed to me that the Contractors, both in letters written during the progress of the work (see letters of McClintic to H. Goldmark, Sept. 12, 1912, file 84-C-S1, Pt. IX, and Sept. 14, 1912, file 84-C-S1 M, Pt. I) and in their present claim went beyond their proper province in stating just what surface was or was not suitable or proper for these end plates in asserting that 75 per cent of the grinding was unnecessary, etc. This was, I hold, fixed once for all by the contract they signed, which required them to plane these plates.

In the inspection it is, of course, not unlikely that in some cases the individual inspectors went beyond their instructions, or were otherwise unreasonable. This is a matter always hard to guard against, and especially in the case of this particular operation, in which accuracy depended so largely on the individual skill of the mechanic. Any individual injustice was guarded against by the appeal to the foreman inspector at each lock, the chief inspector, myself, and my superiors. The fact that the same chief inspector was in charge at all three locks, divided his time between them, gave instructions to all three foremen, and could be appealed to at any time seem to me reason to presume that the inspection was equally severe at all three locks. I can not testify as to this from personal observation. It should be noted, however, that the amount of grinding varied greatly in different leaves. This was due in part to the condition of the plates when they arrived, in part to the care in riveting them to the gates, in part to variations in the skeleton. Where the ends of the girders and the ends of the A frames were in very true lines, and the entire skeleton exceptionally true to shape, the grinding was much less. I think the greater experience at Miraflores in erecting the frame helped to decrease the amount of grinding. The process of grinding these plates was at best expensive and troublesome, and was so felt by myself during the entire period of construction. If I could have convinced myself that its entire omission was permissible I should certainly have recommended a modification of the contract with this object in view. I did not feel at any time that I could conscientiously do this. That the work was a difficult one and very troublesome to the Contractor, and that it was thoroughly well done, I am only too glad to admit.

[Mr. Goldmark's corrections to his report, pp. 17-21, vol. 8.]

Q. Proceed to the next.—A. On page 89, fourth line from the end of the middle paragraph, I said:

He (Mr. Wolfel) offered to show that after the first gate was erected in the field the plates as planed by the shop and riveted in the field would form a



surface equal to or better than would be obtained in case the planing had been done in the field.

That was my recollection when I wrote that paragraph; but I have since then looked at the agreement No. 16, of August 8, 1910, tenth section, which states that:

"The McClintic-Marshall Construction Co. expects to demonstrate during the assembling of some of the gates in their yard that the work can be done so near correct that any minor adjustment can be made by means of babbitting between the end reaction castings and the nickel-steel bearing plates, and the planing of the end plates done at the shop instead of in the field."

That seems to show that Mr. Wolfel's offer at the time as mentioned in my report referred to showing certain things after the first gate was erected in the shop, and not in the field.

I would like to make that correction, though, that that was in accordance with my memory——

Mr. WOLFEL (interposing). Would you not like to correct on page 91, the middle part, beginning: "I am now satisfied that Mr. Hammer," and so on?

Mr. GOLDMARK. I do not remember Mr. Hammer's letter exactly. (Letter, Goldmark to Hammer of Aug. 8, 1910, instructions on turning over the office, see p. 199, Goldmark's report.)

Mr. WOLFEL. Here it is [handing letter to Mr. Goldmark].

Mr. GOLDMARK. I think Mr. Hammer's letter refers to the field; I do not remember.

Judge HARRAH. How was the correction to be made, if one was to be made?

Mr. GOLDMARK. I do not understand this. Mr. Wolfel asked me whether I would not want to correct something on page 91. Would it be proper to see Mr. Hammer's letter first?

Judge HARRAH. It would be entirely proper and in order to see it.

Mr. GOLDMARK. Mr. Wolfel, as I understand it, claims that the matter of planing or not planing the plates could and would be settled by the authorized representative of the Chief Engineer when the gates were assembled in the yard.

Mr. WOLFEL. Well, there is nothing to claim about that. Mr. Goldmark, here is your blue print of the original agreement of August 8, paragraph 16—you have copies of that agreement in your file—which I can submit as evidence.

Judge HARRAH. I think that is all in; it will be put in if it is not.

Mr. WOLFEL (reading): "Permission is granted of making the end reaction castings one story in height only; this is done for the reason that the McClintic-Marshall Construction Co. expects to demonstrate during the assembling of some of the gates in their yard that the work can be done so near correct that any minor adjustment can be made by means of babbitting between the end reaction castings and the nickel-steel bearing plates, and the planing of the end plates done at the shop instead of in the field."

This is from the blue print of the original agreement.

Judge HARRAH. Let the blue print go in the record as Exhibit 2, Goldmark.

(The blue print referred to was marked "Exhibit No. 2, Goldmark.")

Judge HARRAH (continuing). Now, what is the particular point that you want to make?

Mr. WOLFEL. I asked Mr. Goldmark whether, as long as he has made the correction on page 89 concerning the assembling of the gates in the field being the criterion, whether the planing was to be changed to the shop in accordance with the agreement of August 8, he had not better carry forward that correction on the page 91 of his report affected by it. It makes no difference to me.

Mr. GOLDMARK. I would say that the agreement of August 8, 1910, paragraph 16, at the end, says: "And the planing of the end plates done at the shop instead of in the field." The letter purposely was not to do the planing of the end plates at the shop, but to omit the planing entirely; and I state that Mr. Hammer went beyond his authority in making an agreement to omit the planing entirely. He might have allowed them to plane the plates in the shop according to section 16, but how could he entirely omit and waive all planing?

I would also say that, when it was expected to demonstrate, we expected to pass personally upon some of those matters, none of which were ever submitted to me for decision.

Mr. WOLFEL. We could not submit them to you when they were assembled in our yard and you were at the Isthmus.



Mr. GOLDMARK. But they could naturally have given me some information. I admit that was none of your business.

Mr. WOLFEL. That would have to come through your representative; we did not know how far his authority went. We thought he had full authority, as far as we knew.

Mr. GOLDMARK. But you will admit that in connection with omitting the planing you want to read section 16 of the agreement.

Mr. WOLFEL. I admit that; but I have nothing to say about the propriety of doing it or not. In fact, I do not know whether it was at that time a matter of trading. I think I have a definite recollection of it. But as far as the propriety of omitting the planing at the shop was concerned, that, in my estimation, was simply common sense, because the planing at the shop before riveting up could not have done a particle of good, as the driving of the rivets in the shop and in the field would have destroyed the plate's efficiency to make the planing effective, and grinding should have been resorted to, as it was.

I am free to state that that planing was waived at my request and on the strength of those arguments.

Judge HARRAH. Mr. Goldmark, have you any further statement to make in connection with that paragraph?

Mr. GOLDMARK. No; I have not.

[Goldmark's testimony as to end planing, pp. 172-178, vol. 8.]

Mr. Wolfel wants to ask Mr. Goldmark a few questions about page 51-B, "The Contractor was required to grind the nickel-steel bearing plates to an unreasonable extent."

Mr. WOLFEL. Referring to page 89 of his report, Mr. Goldmark corrected his testimony in the last four lines of the third paragraph, from (see pp. 17 and 18 of this testimony):

"He offered to show that after the first gate was erected in the field," and so on, to a statement in accordance with agreement of August 8, paragraph 16, given in Appendix, page 170, No. 20.

That correction is, of course, entirely correct; but it seems to me that if this is correct, some statements on page 91 ought to come out, too, because it reads there, in the third paragraph:

"If, in addition to this, he told them that the planing of these plates in the field would be waived because the plates were straight and smooth before manufacture, he made a mistake, because he could not possibly tell what the surfaces of these plates would be after they were erected in the field and riveted up."

Now, if paragraph 16 of the agreement of August 8 was settled and understood between Mr. Goldmark and myself, there was no other procedure but for somebody at the shops to settle that point when the first leaves were assembled in our yard in accordance with that agreement.

And that Mr. Hammer did, and there was never any question about the thing between me and Mr. Hammer that he had a right to do it.

On the other hand, Mr. Goldmark said Mr. Hammer very properly waived the planing of those plates in the shop as printed in this agreement. Now, that is a thing Mr. Hammer and I had quite a time about, and it took me a long time to have Mr. Hammer agree to that.

Mr. GOLDMARK. Agree to what?

Mr. WOLFEL. To waive the planing of the plates in the shop. But Mr. Hammer's waiving of the planing of the plates in the field was strictly in accordance with our agreement; at least, that is the way I looked upon it and it seems to me your statements on page 91 of your report are in error. Was there any other procedure could have been followed in accordance with our agreement of August 8, 1910?

Now, of course, if Mr. Goldmark, as indicated in his report, was under the impression that I would take that matter up in the field with him, which, on account of my not being on the Isthmus, was out of the question, then it was quite natural that he simply waited for me to act, although he knew the agreement was mighty important to us; and as long as I did not act he dropped the matter, but in the meanwhile Mr. Hammer and I acted.

Judge HARRAH. Mr. Wolfel, do you understand that paragraph to be authority for your omitting planing altogether?

Mr. WOLFEL. Not until we had demonstrated "during the assembling of some of the gates in our yard that the work could be done so near correct that any minor adjustment could be made by means of babbitting between the end reaction castings and the nickel-steel bearing plates," and so on.



Judge HARRAH. Well, was not the demonstration for the purpose of determining whether or not these minor adjustments could be made by the babbitting, provided the planing of the end plates was done in the shop instead of in the field?

Mr. WOLFEL. I know; but it was later on agreed between Mr. Hammer and myself, and as Mr. Goldmark has stated very properly—or something to that effect—in the testimony, the planing in the shop was to remain [to be waived?], because we could not obtain a better surface by planing these plates than we got from the rolled plates.

Judge HARRAH. Then your contention simply is that Mr. Hammer had the right under this agreement, or took the right, to himself to waive the planing of the plates in the shop?

Mr. WOLFEL. I do not know whether Mr. Hammer had the right or took the right. All I know is that it was up to me to prove to the representative of the Isthmian Canal Commission during the assembling of the leaves in our yard that those plates were satisfactory and the planing in the field was not necessary, and that I have done.

By Judge HARRAH:

Q. I call your attention to letter of Col. Hodges to Mr. Jewel, of September 20, 1911, relative to planing end plates, which is in evidence. Your attention having been called specifically to that letter, and the letter of Mr. Jewel to Col. Hodges in reply thereto of September 21, 1911, quoted in your report, page 94, do you wish to change this statement in your report?

“It appears that at this time the Contractor’s management fully acknowledge their ability in this respect.”

A. I think that statement is all right, as Mr. Jewel did not question Col. Hodges’s statements as to the planing, etc., and did not raise the point in any way; and as I have also understood from Mr. Guynn that the other method of doing that planing or finishing was arrived at between him and Mr. Jewel, and was afterwards submitted to me for approval, namely, to remove the matter by means of grinding instead of planing. So I do not think that is too strong a statement as it is.

Well, I would like to say this: The object of the planing was to obtain a good surface; the grinding was an attempt to do that with less trouble, and, presumably, expense. If we found that any part of those plates was sufficiently true without either planing or grinding, Mr. Guynn was instructed to accept them, and he did accept such parts of those surfaces as were sufficiently plain to correspond to the original specifications and give a satisfactory job. In other words, the grinding off of high spots is, in a way, exactly the same thing as the grinding that we did; it is just a question of what should be considered high spots. It was intended as a concession at the time to make things easier rather than harder.

Mr. WOLFEL. In regard to the grinding cold, I wish to state that the matter of grinding was discussed between me and Mr. Hammer when that planing was finally settled, and I was always under the impression that long before this matter was taken up you understood that those end plates would be ground and not planed.

Mr. GOLDMARK. I never understood. Mr. Hammer, as you see in the correspondence, wrote nothing to me about it and said nothing to me about it, and I never knew anything about it. I understood for a long time that there was a perfectly honest difference of opinion between Mr. Wolfel and myself about that. But after section 16 of the agreement of August 8 was signed I never heard anything more about it.

Judge HARRAH. Just let me get one more statement from you, Mr. Wolfel. Under this agreement, and under your agreement with Mr. Hammer and the shop drawings as they were approved, to what extent did you expect to do planing or grinding in the field?

Mr. WOLFEL. I did expect to have to grind off the high spots within a limit that was obtainable under the conditions of the sun playing around these leaves. I claim that the limitation of one sixty-fourth inch imposed upon us by Mr. Goldmark was beyond the limit that could have been obtained by planing, and we would have to spend more money on that grinding than the planing would have cost us.

Judge HARRAH. Do you wish to make any further statement on this subject, Mr. Goldmark?

Mr. GOLDMARK. I would simply like to point out that there seems to have been nothing in writing on that whole important subject between Mr. Wolfel and Mr. Hammer, myself, or any other officer of the Commission, or, as far as anything has been introduced, between the Contractors and Mr. Jewel, or anybody else who would naturally have been in authority.

Mr. WOLFEL. Except that you have a number of drawings that show the whole story.

Mr. GOLDMARK. We have a number of drawings that show certain thicknesses of metal that seem to imply that no planing was contemplated.

Judge HARRAH. I will ask you one more question, Mr. Wolfel: Have you any written communication from Mr. Hammer in relation to the waiving of planing the end plates of the leaves?

Mr. WOLFEL. Nothing but the approved shop drawings that show the whole story.

Judge HARRAH. The approved shop drawings?

Mr. WOLFEL. Yes.

Judge HARRAH. Have those shop drawings been introduced in evidence?

Mr. WOLFEL. I have not put them in evidence, but it is brought out in our claim in detail why the approved shop drawings are the proof of our claim that the planing was waived. It is given there very much in detail.

Judge HARRAH. Page 17 of the Appendix; shop drawings showing thickness of material ordered will go in as evidence. Mr. Wolfel is to submit, under Exhibits Nos. 15, 16, and 17, shop drawings and orders showing thickness of the end plates ordered for eleven-sixteenths, three-fourths, and thirteen-sixteenths inch.

[Pendergrass and Wolfel relative to conversation with Goldmark and Hammer as to waiving end planing, vol. 15, pp. 18-29.]

Mr. WOLFEL. The next thing I would like to take up with you is on page 17, paragraph 20, on that much disputed and discussed matter of planing of the end plates. As stated in the agreement of August 8, 1910, paragraph 16—I wish you would tell me briefly what you know about that.

Mr. PENDERGRASS. The question of planing the ends of the gates was taken up with Mr. Goldmark by Mr. Wolfel, and I remember having been present. I think on several occasions, when Mr. Wolfel was discussing this point with Mr. Goldmark and calling his attention to the fact that the planing as specified was not practicable, owing to the warping of the gates by the unequal distribution of the sun on different parts of the gate. I do not think that I took part in this discussion, but I remember having been present on more than one occasion.

By Judge HARRAH:

Q. Well, where did the discussion take place?—A. The discussion took place here in this office, when Mr. Goldmark was here in July, I guess, 1910—yes; July, 1910—and finally continued at least until the agreement of August 8.

Q. Were there any others present than you and Mr. Goldmark and Mr. Wolfel when those conversations took place?

Mr. PENDERGRASS. Why, I do not remember.

Judge HARRAH. Do you remember, Mr. Wolfel?

Mr. WOLFEL. I hardly think so, Judge Harrah.

Mr. PENDERGRASS. I can not recall anyone; there may have been.

By Judge HARRAH:

Q. Do you remember whether or not the question was discussed at that time, and whether or not it was pointed out by Mr. Wolfel that this was one of the valuable considerations that he was to receive for making the other changes that were indicated in the agreement of August 8, 1910?—A. I believe that it was so understood.

Q. Do you know whether or not that was pointed out as one of the moving causes—one of the reasons why Mr. Wolfel was willing to make such radical changes in the work, and such changes as would cost him the amount of money that it appears to have cost him to make them?—A. I am inclined to believe that it was—that it was understood pretty thoroughly by Mr. Goldmark.

Q. Well, I will ask you if you understood from the conversation of Mr. Goldmark and Mr. Wolfel at that time that the end planing in the field would be expensive if insisted upon?—A. I believe that it was recognized that the elimination of the field planing would save considerable expense.



Q. Do you remember whether they discussed any substitute in the way of grinding in the field for the planing?—A. No, sir; I do not think there was any question that the grinding would be necessary.

Q. Well, did you hear them discuss that question, as to whether or not they would grind off the high spots?—A. I do not recall; I do not remember any such discussion about grinding off the high spots.

Q. You say you do not remember any discussion about them going to grind off the high spots?—A. No, sir.

Q. To do the planing in the shop, if they were able to demonstrate that it would be satisfactory, and then grind the high spots in the field?—A. I do not remember about that.

Q. I want you to read that letter from Mr. Goldmark to Mr. Hammer, of September 19, 1912, relative to the subject of grinding.

(Witness examines letter.)

Q. (Continuing.) I wish to have that introduced as a general exhibit in connection with the testimony of Mr. Pendergrass.

(The letter referred to was marked "General Exhibit No. 4.")

Q. (Continuing.) I find this statement in relation to the grinding in this letter:

"The amount of grinding when the men are experienced has been comparatively small. We do not insist on any straight line from top to bottom of leaf. In other words, the deviation at various points is easily taken care of by the Babbitt-metal filling behind the bearing plates."

When they were discussing the question as to the waiving of the planing in the field, was the question as to how far the use of the Babbitt-metal filling behind the bearing plates would straighten up the surfaces and render the planing unnecessary—was that question discussed at the time?

A. I do not remember definitely. It was my understanding that when the end reaction castings were made in single-story height there would then have to be no planing or field work on the end.

Q. Now, in this letter Mr. Goldmark also states:

"We require the surfaces against which the individual casting rests to have a true surface along the outer edges, vertically and horizontally; also, along the vertical line 8 inches from the downstream face—that is, opposite diaphragm A. We allow low spots to a considerable amount elsewhere. We do not allow individual high spots on which the casting might rest. In other words, we want a fairly decent bearing for the casting."

I will ask you if, when that conversation between Mr. Wolfel and Mr. Goldmark took place, the subject of the way the high spots would be treated in case any were found on the Isthmus was considered?—A. I do not remember of any such.

Q. Do you remember any discussion about how much would be allowed for low spots, and whether or not it would be unimportant if there were low spots back of the edge of the leaf?—A. No, sir.

Q. Now, this letter seems to have been written with a view of taking up the subject of the excessive amount of grinding that the McClintic-Marshall Co. claims to have been required to do with Mr. McClintic on his arrival in New York. Do you remember along about this time—September, 1912—discussing the matter of grinding of the end plates and planing of the end plates with Mr. McClintic?—A. I remember that that matter was up and Mr. McClintic seemed greatly concerned over the amount of that grinding that was being done on the Isthmus, and I am quite sure that I was present when Mr. McClintic talked with Mr. Hammer in regard to that, and Mr. Hammer could not understand why this grinding was necessary—why any grinding, in fact, was necessary. I believe that it was Mr. Hammer that suggested putting in water stops between the end reaction castings and the end plates, and if there were any slight deviations from a—

Q. (Interposing.) Well, we have not Mr. Hammer here, and we will have to go at it carefully. I want you to look at that letter of September 16, 1912, from Mr. Hammer to Mr. Goldmark [handing paper to witness]. Have you read that?—A. Yes, sir.

Q. This is a letter from Mr. Hammer to Mr. Goldmark, dated September 16, 1912; that will be found as Exhibit No. 34 in Mr. Wolfel's testimony, and will also be made General Exhibit No. 5, in connection with the testimony of Mr. Pendergrass.

(The letter referred to was marked "General Exhibit No. 5.")



Q. (Continuing.) Mr. Pendergrass, do you remember discussing the subject of grinding, as mentioned in this letter of September 16, 1912, with Mr. Hammer? That was some time before the meeting of Mr. McClintic and Mr. Goldmark in New York.—A. Well, I do not know that I could add anything to what I have already said. I am quite sure that I was present when Mr. McClintic discussed this with Mr. Hammer. I do not think that I had any discussion of my own with Mr. Hammer in regard to it.

Q. Well, is it your recollection that that letter expresses about the views that Mr. Hammer gave to Mr. McClintic as to what he thought was necessary?—A. (Examining letter.) This letter of Mr. Hammer's is more in detail than I remember. The principal point that I remember is that Mr. McClintic was very indignant over the amount of grinding, and that in telling Mr. Hammer about it Mr. Hammer could not understand why any such grinding was necessary, and that the idea was that any slight inaccuracies that might occur—and that any necessity for any grinding—would be obviated by the use of water stops. My recollection of it is that, according to Mr. Hammer's idea, there would be practically no grinding.

Q. I want to introduce the letter from Mr. Hammer to Mr. Goldmark, dated September 13, 1912. This will be General Exhibit No. 6.

(The paper was so marked.)

Q. (Continuing.) The particular part of this letter to which I wish to call your attention is as follows:

"I received a copy of Mr. McClintic's letter of the 12th instant to you, in reference to the Contractors' change in their management on the Isthmus; also alluding to the matter of grinding the ends of the leaves.

As stated in Mr. McClintic's letter, he discussed this matter with me; and as I have heard no reason, it could not be explained by me why a great amount of grinding has been found necessary, although it was realized that grinding would be necessary to remove high spots so as to give the reaction castings a good bearing, especially against these parts of the end plates that are backed up by the reaction frames.

The letter of September 19, from Mr. Goldmark to Mr. Hammer, appears to have been in reply to these letters from Mr. Hammer.

I wish to introduce a letter dated July 2, 1912, from Mr. Goldmark to Mr. Hammer, which has to do with the erection of the first leaf, and shows how the first leaf went together. That letter will go in as General Exhibit No. 7.

(The letter referred to was marked "General Exhibit No. 7.")

Q. (Continuing.) I will not read the whole of this letter unless you would like to hear it.

(Witness reads letter.)

Q. (Continuing.) Now, at the time this subject of the excessive grinding was taken up by Mr. Goldmark, the first leaf had been erected and the results indicated in that letter had been obtained from the first leaves. Now, as I understand from your testimony, the conversation with Mr. Hammer in relation to the subject of excessive grinding took place after the time that he must have received that letter and that report from Mr. Goldmark; is that true?—A. Well, I could not say; I have not the dates.

Q. Well, that letter dated July 2 would be received by Mr. Hammer about July 10?—A. When was this other correspondence?

Q. This other correspondence that I showed was in the following September. Mr. STERRETT. September 19.

Mr. PENDERGRASS. Well, I would say that Mr. Hammer must have had that letter; that letter was from Mr. Goldmark to Mr. Hammer, was it?

Judge HARRAH. Yes. I want to ask you, then, if in that conversation with Mr. Hammer anything was said by Mr. Goldmark or Mr. McClintic or Mr. Hammer as to the fit of the leaves that had already been erected?

Mr. PENDERGRASS. I do not remember.

Q. You do not remember whether that was discussed or not?—A. No.

Q. That is all, I think, on the subject of grinding. I simply want to bring out the facts, if any of you know about the facts, as to whether or not the question of the accuracy of the fit of those leaves was discussed with Mr. Hammer, and whether or not that was advanced as a reason why there was excessive grinding being done on the Isthmus.

Mr. WOLFEL. I knew Mr. Hammer had a letter, because as soon as the first water test was made he came to me, seeming very much delighted; he said, "I have just got a letter from Mr. Goldmark telling me the water tests have just



been made and were entirely satisfactory, and everything is all right." And that is all I know.

Judge HARRAH. Well, did you ever discuss the question of excessive grinding with Mr. Hammer?

Mr. WOLFEL. We all had been talking about the thing all the time. Would you want, Mr. Pendergrass, to say anything about the waiving of the shop planing of the bent plates? You can continue with that general statement you were making.

Mr. PENDERGRASS. When the field planing was waived the matter of planing of end plates in the shop had not been settled, so that the material for the end plates was not ordered, except for the one leaf, which plate was necessary for assembling the leaf in the yard, as it was expected that that assembling in the yard would demonstrate that there was no necessity of planing these plates in the shop. The waiving of the planing of the end plates in the shop was, I believe, obtained by Mr. Wolfel after this leaf had been assembled, and instructions then given to me to order material without any allowance for planing for the balance of the leaf.

By Judge HARRAH:

Q. Was the material ordered in that way?—A. Yes, sir.

Q. Did you plane the first leaf?—A. No, sir.

Q. Then, the test in the shop to determine whether the shop planing would be waived or not was made with a leaf that had not been planed or treated in your shop?—A. That is my recollection, that the plate was not planed in the first leaf.

Judge HARRAH. Is that correct, Mr. Wolfel?

Mr. WOLFEL. Entirely correct; yes.

Mr. PENDERGRASS. Because if it had been planed it would not have shown anything. That is a matter of record in the material ordered.

Judge HARRAH. Then the end plates that were subsequently ordered for the other gates were the same character of plates, rolled in the same way, that the end plates on the first test leaf had been rolled; is that right?

Mr. WOLFEL. That is correct, except for some of the lighter leaves and some of the heavier leaves the thickness was changed slightly, to correspond to the thickness of the bent plates, in order to keep the distance from the end plate to the girder always at right angles. You see, if the end plate was thinner it made the bent plate a little heavier; if the end plate got thicker it made the bent plate a little lighter, because we wanted to keep the castings all the same. This is brought out in our claim, page 18.

Judge HARRAH. Is that right, Mr. Price?

Mr. PRICE. That is correct; that is the way they were ordered, as shown by the drawings. (See Exhibits 15, 16, 17, Goldmark.)

Judge HARRAH. That they ordered the material with a view, and of such thickness, that there would be no allowance—

Mr. PRICE. No allowance for planing.

Mr. WINTERBOTTOM. That is right.

Mr. WOLFEL. Mr. Winterbottom, when you went over the drawings with Mr. Hammer for approval, was he not very particular always to scrutinize the workmanship?

Mr. WINTERBOTTOM. Mr. Hammer was always very particular as to any notes regarding the workmanship on the drawings. One of the first things he always looked to with regard to the approval of a drawing was the workmanship—any notes regarding planing, or any special shop operation, or any operation that had to be done in the field.

Mr. WOLFEL. Now, these drawings showing these end and bent plates as submitted and approved by Mr. Hammer had no notation on them as to planing, either in the shop or in the field?

Mr. WINTERBOTTOM. There was no notation on the drawing regarding planing either in the shop or the field.

Mr. WOLFEL. Referring to the agreement of August 8, 1910, and the changes made by the same, have you made a study of how these changes affected the weight and the cost to the Commission?

Mr. PENDERGRASS. Yes, sir. We prepared an itemized list showing the material added or deducted on account of the various changes as outlined in this agreement, together with the increased cost or saving to the Commission, based on the contract prices for various items.

By Judge HARRAH:

Q. Mr. Pendergrass, does the testimony that you are starting to give now refer to the estimate that you furnished as to the changes in cost for labor and material that resulted from the agreement made by Mr. Goldmark and Mr. Wolfel, dated August 8, 1910, and other changes shown in the claim and furnished to me when I was here examining the books?—A. This is not the same. [Examining paper.] Some of the figures in this are also used in that other.

Q. Well, do you expect this to take the place of and operate as a substitute for that estimate given here?—A. No, sir.

Q. All right; go ahead.—A. This summary indicates a net saving to the Commission of 422,410 pounds, and a saving to the Commission of \$26,678.62.

Q. Mr. Pendergrass, I would like you to put that in as an exhibit and explain the purpose of it.

(The paper so referred to was marked "Exhibit No. 3, Pendergrass.")

This testimony shows that the subject of waiving the field planing was discussed at the time the agreement of August 8, 1910, was made. (See p. 381 of this report, quoting from Mr. Goldmark's report, vol. 1 of the testimony, p. 89.) It also shows that the Contractor understood that paragraph 16 of the agreement of August 8, 1910, was authority for waiving the planing in the field. It was understood, however, that the high spots should be ground off. Mr. Wolfel, in his testimony quoted on page 391 of this report, page 176 of his testimony, states:

I did expect to have to grind off the high spots within a limit that was obtainable under the conditions of the sun playing around these leaves. I claim that the limitation of one-sixty-fourth inch imposed upon us by Mr. Goldmark was beyond the limit that could have been obtained by planing; and we would have to spend more money on that grinding than the planing would have cost us.

It also shows that Mr. Hammer's action in approving the drawings without any provision for shop planing was in accordance with what Mr. Goldmark considered the proper action to take. (See p. 382 of this report, quoting from Mr. Goldmark's report, p. 91, as follows:)

I am entirely satisfied that Mr. Hammer did well, if he did so, in recommending to the Contractor to abandon shop planing.

Mr. Goldmark also states, page 382 of this report:

If, in addition to this, he told them that planing of these plates in the field would be waived because the plates were straight and smooth before manufacture (see Wolfel's letter, p. 17), he made a mistake, because he could not possibly tell what the surface of these plates would be after they were erected in the field and riveted up. Owing to possible errors in the length of the girders, in their setting, and other errors in erection, differences in the thickness of the combined end and bent plates, changes due to riveting, etc., there was no one who could at that time foresee what would be the condition of those plates after erection.

The evidence shows that the Contractor believed that the planing in the field had been waived under proper authority. He was allowed to order his material of such thickness as to indicate clearly that no planing was to be done in the field. The only grinding which, under any view of the case, the Contractor might reasonably be expected to do was such as was necessary to secure a surface for the end plates that would have given a bearing for the end reaction castings equal to that which could have been obtained by planing in the field.

The testimony referred to in the Contractor's brief, pages 117 to 128, establishes the fact that much unnecessary grinding was done.



and that a great deal more grinding was required than the Contractor might reasonably have expected under paragraph 16 of the agreement of August 8, 1910.

That part of the Contractor's claim, page 49 of the claim, page 117 of his brief, in which he states that "they insisted upon having the work executed in a spirit contrary to the previous agreement," is substantially established.

The remainder of this claim, which states that, "And also on having work done distinctly not called for in the specifications," relates to the grinding done on the nickel-steel bearing plates. There is no provision in paragraph 123 of the specifications, quoted on page 370 of this report, for grinding these bearing plates. The only reason that could be given for requiring these plates to be ground would be under the provisions in the specifications calling for first-class workmanship. From any view of the case, however, it seems to be pretty well established from the testimony that unnecessary grinding was required on these plates. (See testimony referred to by the Contractor in his brief, pp. 122 to 128, inclusive.) This part of the claim is substantially established.

The Contractor does not, however, give any and can not give any specific evidence as to the amount of excess grinding. In his distribution of the cost the grinding was not kept separate. It was taken up as a part of the machine work, and the claim is based upon the theory that one-third of the total cost of the machine work at Miraflores was grinding, and that three-fourths of this grinding was unnecessary, and this amount is deducted from the total cost at Miraflores in establishing the normal cost to be applied at the other lock sites. In the distribution of cost given by the Contractor the amount of machine work as stated at the three lock sites was \$270,605.11. The Contractor claims, however, that this is not accurate as to Pedro Miguel and Gatun. If this should be accepted as an accurate statement of the amount of machine work done and one-third of it taken as representing the grinding, the grinding would cost \$90,201.70. One-fourth of this would be \$22,550.42, as representing all the grinding that the Contractor claims he ought to have done. If we take the claim at Miraflores alone, the amount of grinding that he claims he should have done would amount to \$9,991. On the basis of this claim, if applied to the other two lock sites and a small allowance made for more grinding at Gatun and Pedro Miguel than was done at Miraflores, the amount of his claim for excess grinding would be about \$105,000. If we take the grinding by leaves, it would amount to \$1,427 a leaf at Miraflores. The excess grinding for which claim is made would amount to \$1.070 per leaf at Miraflores.

Mr. Goldmark in his report states that there are about 25,000 square feet in all the gates. Under the claim of the Contractor the average excess grinding on each square foot of these plates, allowing a reasonable sum for grinding the nickel-steel bearing plates, would amount to about \$3 a square foot, and the total grinding under the assumed basis of the Contractor would amount to an average of about \$4.500 per square foot for the entire surface of the end plates.

If the grinding was costing \$20 per day per leaf at Gatun, for the amount of money the Contractor claims to have expended for labor



in grinding he could have ground 71 days on each leaf. It is not probable that he spent more than \$15 or \$20 a day in grinding on any one leaf, and it is not probable from the evidence that on the average he ground anything like the time that he would have been required to grind in order to have spent the large sum of money that he assumes he did spend.

It seems that the claim for excessive grinding, in the manner in which the amount is arrived at, is entirely too much. In arriving at the amount that should be allowed to cover the excess for grinding, the estimate of the Contractor as to what it would have cost him to have done the planing—shown on page 371 of this report—and the amount of extra shop and field labor that he assumed and the saving to the Commission by reason of the changes made by the agreement of August 8, 1910, will be taken into consideration.

From the data that your committee has been able to obtain in connection with the grinding, and as to what it actually cost, it is impossible to do better than make what would seem to be a reasonable estimate as to the amount of the necessary grinding and the amount of the excess grinding. If the excess grinding should be put at \$400 per leaf, it would just about equal the extra charge and field labor that the Contractor undertook to do as a consideration for waiving the end planing. It is thought that it would be just, fair, and equitable to so adjudicate the claim that the Contractor will be reimbursed to the extent that he undertook to do extra shop and field work by reason of the grinding of the end plates, with a small allowance in addition for the extra work and expense that he was put to in grinding the nickel-steel bearing plates.

The excess grinding at Miraflores, in fixing the normal on page 75 of the Contractor's claim, will be fixed at \$500 a leaf for all of the leaves at Miraflores, or \$14,000. This excess is arrived at as heretofore stated, and is placed at the sum of \$14,000 in order that the Contractor may receive the benefit of the consideration which he gave up for the agreement of August 8, 1910, and also in order that he may be reimbursed a reasonable sum for the excess grinding that he was required to do on the nickel-steel bearing plates.

One of the reasons for making the reduction in the claim for the excess grinding is because it is not believed that the Contractor spent as much money for grinding as his claim indicates he did. See testimony of J. W. Wright taken at Balboa December 1, 1915, volume 39. It is believed that the amount to be deducted from the actual expense at Miraflores in arriving at a normal will result in an equitable and just allowance as to the amount that should be paid for excessive grinding and finishing of the end plates and the nickel-steel bearing plates. In other words, an effort has been made to so adjust the claim that the Contractor will receive the consideration which he gave up for waiving the end planing in the field under paragraph 16 of the agreement of August 8, 1910, and which he subsequently lost by reason of the excessive grinding required, and be reimbursed also for such grinding as he did in excess of that from which he was relieved by the agreement of August 8, 1910, and also for such excess grinding as he did on the nickel-steel bearing plates.



The following references are given to the testimony covering the subject of planing the end plates and the grinding:

Goldmark, volume 1, pages 86 to 98.

Wolfel, volume 7, pages 106 to 153; pages 106 to 123, quoted in this report.

Wolfel, volume 7, pages 251 to 252.

Wolfel, volume 7, pages 144 to 149.

Pendergrass, volume 15, pages 18 to 28, quoted in this report.

Courter, volume 16, pages 68 and 79.

Hess, volume 17, pages 54 and 75.

E. K. Morse, volume 19, pages 11 to 13.

Childers, volume 32, pages 55 to 156.

Dumville, volume 32, pages 28, 102, 103, 111.

Guynn, volume 32, pages 177, 178, 179, 187, 219, 222.

(See volume of letters copies from files, pp. 154, 132, 133, and 134.)

In volume 7, pages 123 to 153, is found the technical discussion of the feasibility of grinding or planing the entire surface on end plate to a true plane on account of the effect of variations in temperature.

#### CLEANING.

On page 49 of the claim the Contractor states:

That on account of the inadequate shop painting and unreasonable inspection, the Contractor was obliged to do unnecessary interior cleaning.

In arriving at the normal at Miraflores, page 75 of the claim, the Contractor makes the following deduction from the actual expense covering the item of cleaning.

(g) *Excess cleaning, one-half of \$14,800 (\$14,856), \$7,428.*

On pages 81 and 82, under the heading of "Excess Cleaning," the Contractor states:

(g) *Excess cleaning.*—The Contractor spent at Miraflores \$14,800 for cleaning the interior of the leaves. One-half of this cleaning had to be done on account of the paint called for by the Commission deteriorating under the climatic conditions on the Isthmus.

The Contractor therefore claims one-half of \$14,856, or \$7,428.

On page 50 of the claim as a part of the unreasonable demands made by the inspectors on the Isthmus, the Contractor states:

(e) On account of the inefficiency of the single shop coat of paint and the unreasonable demands of the inspectors on the Isthmus, the Contractor was required to clean the inside of the leaves, before the bitumastic enamel was applied, in a manner not contemplated by the specifications or demanded by the paint contractor.

The main facts on which the Contractor relies in support of his claim for excess cleaning are stated on pages 60, 61, and 62 of the claim, and are quoted below:

The unnecessary cleaning of the interior of the leaves was another item of large expense to the Contractor.

Owing to the climatic conditions and to the kind of paint which was applied to the material on the inside of the leaves at the shop, there was considerable rust formed during the period of erection, which largely increased the amount of cleaning on the inside of the leaves before enameling.

From the time this work started at Gatun, the Contractor's men in charge continually complained of the inspectors. This matter was taken up repeatedly with Mr. Guynn and Mr. Dumville, but the Contractor was unable to get any relief and the inspection continued to grow so much more rigid on this part of the work that it was well nigh impossible to get a leaf passed.

After leaf No. 6 had been rejected, with the statement that if the Contractor would give it two more days' cleaning they would again inspect it, the superintendent of the Contractor in charge at once inspected the part of the leaf rejected and found it clean. He ordered all men out of the leaf, and asked Mr. Dumville to accept the leaf and not allow the man who had condemned it to do any more inspecting; otherwise he would demand an investigation. Mr. Dumville refused this request. The matter was taken up with the chairman, and Col. Dixon was appointed to inspect the leaf and report to the chairman. The inspection was made and the leaf accepted, with little or no additional cleaning.

The method of inspecting the leaves for inside cleaning was to rub the hand over the surface, and if it became soiled the leaf was rejected.

The expense incurred by the Contractor for cleaning the interior of these leaves is as follows:

Miraflores, 28 leaves, \$17,551, or \$627 per leaf.

Pedro Miguel, 24 leaves, \$14,883, or \$621 per leaf.

Gatun, 40 leaves, \$77,269, or \$1,932 per leaf.

This bears out above statement about the kind of cleaning the Contractor had to do at Gatun, and incidentally bears out the previous statement as to the severeness of the Gatun inspection.

A large part of the cleaning in the first place was caused by the bitumastic paint, called for in the specifications, being inadequate to meet the climatic conditions at the Isthmus. This is borne out by correspondence with Mr. Jewel, also by Mr. Hammer's letter of June 1, 1911, in which he states:

"Referring to lock-gate material received on the Isthmus, I beg to call your attention to some serious trouble found with material painted with bitumastic solution:

"I have been informed in telegram of this date that large rust spots have occurred within a few weeks after unloading the material on the Isthmus. The bitumastic solution used for the shop coat is, therefore, considered unsatisfactory, and no more bitumastic solution must be used on material before the matter has been investigated."

This is further borne out by a supplemental agreement entered into December 6, 1911, between the Commission and the Contractor, in which the Commission agrees to pay the Contractor \$158,120 to change the bitumastic paint on the interior of the leaves originally specified to bitumastic enamel. The Contractor is sure that on account of the inefficiency of the paint called for, even at Miraflores and Pedro Miguel, the cost for this interior cleaning was at least doubled, while at Gatun, of course, the Contractor had a big additional waste of money, pure and simple, due to the overexacting conditions imposed upon the Contractor by the inspectors.

Paragraphs 104 to 111 of the original specifications cover the subject of painting and cleaning very thoroughly. Paragraph 105 provides specifically the manner in which the inside of the leaf shall be treated. This paragraph is quoted below:

105. The surface inside of the leaf shall be treated as follows: Before shipment from the shops in the United States all metallic surfaces which after erection will form the interior surfaces of the air and water chambers, including the girders, sheathing, beams, intercostals, vertical frames, piping, etc., shall receive as a first coat one coat of bitumastic solution made by the American Bitumastic Enamel Co., of Philadelphia, and applied cold to the satisfaction of the manufacturers. An exception from this shall be made in the case of the girders at the bottom of the gate, which shall receive a thin shop coat of the red-lead paint specified below, to be replaced by a cement covering which shall be applied as specified in detail hereafter. The upper surface of all the other horizontal girders in the interior, and all vertical surfaces to a height of 10 inches above the centers of the girders shall, after the final erection of the gates, be coated with bitumastic enamel made by the manufacturers named above and applied hot by them in their most approved manner. All other interior surfaces shall, after the gates are erected, receive a second coat of bitumastic solution applied cold.



The testimony upon which the Contractor relies in support of his claim for excess cleaning is referred to and commented on on pages 135 to 140 of his brief. The references as to cleaning and painting are as follows (see p. 140 of Contractor's brief) :

Testimony of—	Volume.	Page references.	Testimony of—	Volume.	Page references.
Mr. Hess.....	17	67 to 68.	Mr. Mellon.....	35	43 and 44.
Mr. Guynn.....	32	182 to 184.	Mr. Roberts.....	35	53.
Mr. Wright.....	32	131, 134, and 139.	Mr. Goldmark.....	8	81, 82, and 182 to 192.
Mr. Dumville.....	32	104 to 106 and 117.	Do.....	1	108 to 117 (report).
Mr. Howe.....	32	75 and 84.			
Mr. Childers.....	32	55, 56, and 66.			

Mr. Guynn's report to Col. Hodges dated Dec. 15, 1914, page 19.

After carefully examining the files in relation to the subject of cleaning, Mr. Goldmark, in his report, volume 1 of the testimony, pages 108 to 117, inclusive, states:

*(d) Claim 4.—Unnecessary interior cleaning.*

Claim 4, page 9, of the Contractor's claims:

"That on account of inadequate shop painting and unreasonable inspection the Contractor was obliged to do unnecessary interior cleaning. On account of the above the Contractor was seriously delayed and put to much extra expense."

This claim is described more in detail on pages 60 to 62.

The painting of the interior to the gates was governed by sections 104 to 111 of the specifications circular 576. All material was cleaned in the shop by sand-blasting or by pickling. All material for the interior was painted one coat of bitumastic solution, applied cold, in the shop. According to the original contract, the upper surface of all horizontal girders, except the bottom one, in the interior, and all vertical surfaces to a height of 10 inches above the girders were to be coated after the final erection of the gates with bitumastic enamel, applied hot. By supplemental agreement of December 6, 1911, this application of hot enamel was extended to cover all interior surfaces of the gates. It was also specified in the original contract that—

"If at any time before erection any part of the coated surfaces becomes so injured by the weather or otherwise as to require recoating, this shall be promptly done, free of charge, to the satisfaction of the chief engineer or his authorized representatives.

"In no case shall the paint be applied out of doors in rainy, misty, or freezing weather, and all surfaces on which paint is applied must be at the time dry and clean."

It should be noted that this material was not ordinary paint, but a special compound requiring great care in its application and extremely expensive as compared with any other coating in use at the present time. The total cost of painting the interior amounted to about \$350,000 for approximately 3,000,000 square feet of area, or at the rate of over 11 cents per square foot. This is three to four times as much as it would have cost to paint the interior with three coats of red lead or other paints in the same manner as the outside of the gates was treated. (See letter of the McClintic-Marshall Construction Co. to the American Bitumastic Enamel Co. of Sept. 20, 1911, file 84-C-81-P, pt. I.)

The surfaces to which coatings of this kind are applied must always be absolutely free from any other kind of paint, from rust, grease, loose material, or any form of dirt. In this respect various coatings differ. (See letter of the American Bitumastic Enamel Co. to Henry Goldmark of Jan. 24, 1910, file 84-C-81-P, pt. I, "To insure a perfect and satisfactory job, all the surfaces of the steel must be thoroughly clean and dry and free from all oil paints," also letter of the American Bitumastic Enamel Co. to Henry Goldmark of Feb. 22, 1910, "We are always careful to dry and get a clean surface.")

Before adopting this paint the writer had some talk and correspondence with Mr. Henry Williams, naval constructor, United States Navy, and a recognized authority on paints as applied to ship work, and was impressed by him with the necessity of thorough cleaning. After the work was started on the Isthmus the



writer had a further conversation with Mr. W. G. Comber, resident engineer, Panama Canal, who had had large experience in the use of compounds of this kind on barges and dredges with the Mississippi River Commission. Mr. Comber told the writer that absolute cleanness was essential in order to obtain results worth having, otherwise it would not be worth while to use this kind of paint. He said that in their practice they found it necessary to clean by the sand-blast a small portion of the metal at a time, apply the coating before this portion had a chance to get dirty or rusty, then proceed with the cleaning and painting of successive parts.

Our experience on the Isthmus fully bore out the necessity of getting as clean a surface as possible before applying bitumastic enamel. Even after using great care a number of spots were found in the upper guard gates and other gates at Gatun, which were personally inspected by the writer, and on which large blisters formed on a number of different girders. On removing these it appeared that the surface of the material underneath had not been perfectly cleaned.

The amount of cleaning required in any given case and the condition of the surface which should be insisted upon are, of course, matters upon which judgments may differ. As a matter of fact, the intention when the specifications were written was to treat the material in such a way that the sand-blasted surface, which was absolutely clean in the shop, should at no time become exposed to rust. In other words, that the bitumastic solution applied in the shop, supplemented by such additional painting as might be necessary in the field, should protect the steel until the hot enamel could be applied to it permanently after erection.

This condition of affairs by no means prevailed. Sand blasting or pickling was done with great care in the shop, so that no scale, rust, or other impurity remained on the material before it received the shop coat. In case any oil or other material had become attached which the sand blasting might not remove, gasoline was used in order to get a perfectly clean surface. As a matter of fact, the bitumastic solution did not prove successful in protecting the metal even until its arrival on the Isthmus, and after it reached there it deteriorated still more rapidly (see letter of Col. Hodges to general purchasing officer of June 5, 1911, file 84-C-81-P, Pt. I), disappearing, as it were, from the surface of the metal. I believe that this condition was worst in the early shipments and that a somewhat more careful painting under the direction of the manufacturers of the paint at the shops improved conditions in subsequent shipments.

The tops of girders and some of the smaller parts seemed most badly affected. Some portions of the steel remained in quite good condition. Under the clause of the contract given above the Contractor repainted, in some cases several times, a great deal of this material, but it proved impossible to reach all parts without interfering seriously with other work. The result was that these surfaces, instead of remaining absolutely protected, rusted more or less before the gates were erected.

Many of the gates remained unfinished for a long period of time, months and even years elapsing until the final paint was done. The result was that when they started to apply the hot solution the interior of the gates was in very bad condition. (See letter of Col. Hodges to Mr. Sterrett of Oct. 21, 1912, file 84-C-81-P, Pt. II, referring to the poor condition of the interior, especially at Gatun, asking him to proceed with cleaning the same.)

On November 5, 1912, Mr. Guynn made a report to the writer on the condition of the paint at Gatun, with which he inclosed a detailed report from Inspector Hastings, giving the condition of the material in gates, leaves 9 and 25, leaf 9 being in the lower chamber and leaf 25 in the upper chamber. Mr. Guynn in his letter says:

"This report is a fair average of the condition of nearly all the leaves at Gatun. Mr. Hastings reports leaf 9, first panel, rivets beginning to rust and pit.  $2\frac{1}{2}$  inches water standing, with rubbish, bolts, and dirt, upon bottom girder; second panel, girder badly scaled and pitted, also angles; third panel, girder badly scaled, rivets pitted, and similarly for practically all the girders. He says in this leaf, from the tenth panel up, the girders shows lots of scale, rivets badly incrustated, especially on chord angles. Leaf No. 25, first panel, rivet heads pitted; second panel, local scale on sheathing nearly one thirty-second inch thick, top of girder pitted. Near sounding pipe, top of girder badly scaled, and similarly for all other panels. Near top of gate all chord angles are getting badly scaled and rivets pitted. This leaf is full of dirt and steel cuttings, which hold the moisture entering from frequent rains."



At about this time the writer personally examined one or two of the leaves toward the upper end of the lock. A question had arisen as to the extreme severity of Inspector Hastings's inspection. The leaves at that time were in many places very dirty, with much loose paint, rust, pitting, a considerable amount of oil, chips from the reaming of the rivet holes, and other foreign material. A thorough cleaning was imperative. Some confusion had arisen at the time from the desire of the paint contractors to push their work on these leaves prior to thorough cleaning. After examining the leaves, and especially after they had applied their paint over a girder that was badly rusted, I insisted that they should not enter a leaf until all the cleaning in it had been satisfactorily done and the leaf accepted as being clean. The necessity for cleaning was referred to in letter from the writer to Mr. L. L. Jewel, dated February 26, 1912, file 17, No. 3, and also in a letter from Mr. Rousseau, acting chairman, to Mr. Sterrett, of January 15, 1913, file 84-C-81-P, Part II, which last letter covers the subject very fully. In it he says:

"I understand that the inspectors in charge have found much difficulty in obtaining the desired results, namely, such cleaning of the surfaces as shall leave a mere discoloration of the metal, but no rust that can be removed. At the present time at Gatun, and also to some extent at Pedro Miguel, a large number of leaves are standing with their interior surfaces in bad condition."

A decided effort was made at this time by the Contractor to reduce the amount of cleaning. I fully realized that it was a very expensive matter for them, but I did not think then, and I do not think now, that any more was required than was necessary.

It was, however, difficult and extremely disagreeable work for the men employed in doing the cleaning and the inspecting. They worked in absolute darkness, hot and confined spaces, by the light of a candle. The fact remains that no means were used to remove the material except the ordinary wire brush and scraper and small brushes for handling the debris as it was loosened. As the material had been sand blasted, there was no rolling-mill scale, and it was, in my opinion, absolutely necessary that all material on the steel, except sound paint adhering perfectly, should be removed.

There is no doubt whatsoever that the fact that the shop coat of paint did not give satisfactory results added considerably to the cost of cleaning the interior, although in view of the fact that the erection occupied a long period of time; that many of the parts were exposed to the weather a long time; that a large number of chips and much oil and dirt accumulated in the gates, the getting of the gates into condition would in any event have involved a great deal of labor.

With regard to the claim of the Contractors that the inspection was more severe at Gatun than elsewhere, I would say that I have never thought so, although I spent much time at all the locks conferring with the inspectors on this very subject, while the chief inspector was, of course, in close touch at all times. The reason why there was less expense at Pedro Miguel and Miraflores was, I think, that the material reached the Isthmus in better condition; that it was erected and painted without being stored as long a time as at Gatun; and also on account of the climatic conditions, which were far more severe at Gatun. There was no doubt in my mind at the time that the interior of the gates in the Pacific division were never in as bad shape as those at Gatun.

The total cost of the cleaning at Gatun is given as \$77,269. I have no means of checking this at present, but recollect that at the time I estimated that it would be at least \$50,000, basing this estimate upon the number of men they had at work, etc.

I have no data as to cost in the other locks.

The use of the bitumastic solution as a shop paint was prescribed in the specifications, the Contractor having no part in its selection and no option as to whether he would use it or not. A considerable part of the cleaning was made necessary by the poor quality of this paint. Just how much, it is impossible to say, but I am inclined to think that if red lead had been used the cleaning at Pedro Miguel and Miraflores would have been reduced by about one-half and at Gatun by about two-thirds.

In the application of this shop coat and in doing the work generally the instructions of the American Bitumastic Enamel Co. were followed. They objected to the application of red lead or any other paint at the shop to those surfaces which were to be treated with their enamel in the field. They were



asked to permit this in order to obviate the use of two kinds of paint in the shop—red lead for exterior and bitumastic solution for the interior surface.

A letter to the writer dated February 22, 1910, file 84-C-81/P, Part I, gives the American Bitumastic Co.'s objections.

They were evidently at fault in recommending the solution for material which was to be exposed to the weather as this steel was prior to its final erection.

For list of letters referring to that part of claim 4 concerned with "Unnecessary interior cleaning," see page 117 of Mr. Goldmark's report, volume 1.

Soon after the material began to arrive on the Isthmus, on June 5, 1911, Col. Hodges wrote to Maj. Boggs, the general purchasing officer, explaining that the bitumastic solution did not appear to be suitable to the climatic conditions on the Isthmus. This letter is quoted below (see vol. 4, No. 206—copies of letters):

On May 31 I sent you a cablegram, of which the following is a copy:

"Referring to section 105, Circular 576. Shop coat bitumastic solution. Material shows widespread rusting within few weeks after unloading. Apparently entirely worthless under our conditions. Unless paint manufacturers can make radical improvement immediately, we must cancel order. Take up directly with American Bitumastic Co., Philadelphia. See our letter to them dated May 22, 1911. Suggest sending Post there, if possible. Similar paint has been used in seagoing dredges. Immediate action imperative. Cable results."

The reason for this message was the fact that a considerable portion of the lock-gate material which has been received here within the last month shows extended rusting. As you are probably aware, according to Circular 576, two kinds of paint are to be applied by the Contractor in addition to the final field coat to be selected and furnished by the Commission after erection is entirely completed, same to be applied by the Contractor free of charge for labor of application. In the shops at Pittsburgh all the material is to be cleaned of scale, etc., either by sand blasting or pickling. The original contract specified sand blasting throughout, but permission has been granted the Contractor since then to pickle certain parts instead of sand blasting them.

In the shops all the surfaces of the metal which will form the interior surfaces of the air and water chambers after erection are to be coated with bitumastic solution (one coat) as manufactured by the American Bitumastic Co. of Philadelphia, to be applied cold. After the gates are fully erected the upper surfaces of the horizontal girders in the interior and vertical surfaces to a height of 10 inches above the girders will be coated with bitumastic enamel, applied hot. After erection all other interior surfaces are to receive a second coat of bitumastic solution applied cold. All other material is painted in the shops with one coat of red lead and will receive a second coat of red lead after erection.

The paint on all the material when received on the Isthmus appeared to be in good condition, excepting the bitumastic solution on certain of the girders which were exposed on the decks of the steamer, on which the paint had largely disappeared. No material was received here prior to May 1, so that it had not been on the Isthmus more than a month. The girders and other material were brought to the lock sites at Gatun and Pedro Miguel and there placed on skids awaiting erection. About two weeks ago some of the girders and intercostals painted with bitumastic solution appeared to be rusted. The girders were placed horizontally, three or four high. The lower girders which were protected by the upper girders did not appear to have rusted much. The uppermost upper surface of the top girder and some of the lower girders at their ends where they were less well protected by the top girders, showed extended rusting and an apparent disappearance or thinning of the paint over the entire area in question.

Similarly smaller parts which were coated with bitumastic enamel showed rusted spots especially horizontal surfaces. The vertical surfaces were properly protected by projecting flanges, angles, etc., and were in much better condition, in many cases perfect condition. All the parts coated with red lead also appeared to be in very much better condition, except where abraded by contact with some hard substance. The bitumastic material was selected as being of



exceptional excellence and supplied exactly as requested by the manufacturers of the paint. The combination of bitumastic solution applied cold and bitumastic enamel applied hot is exactly what was done in the dry dock *Dewey* and in many war and merchant ships, also in our two seagoing dredges.

Since its arrival on the Isthmus the material has been exposed to a great deal of rain and alternating very hot sunshine, and clearly does not withstand these conditions at all, as the time of exposure has been very short. In view of the excellent reputation of the manufacturers and the widespread use of their product it seems fair that they should have an opportunity to explain the failure of their product and perhaps suggest some change by which better results can be obtained.

The contractors are finishing about 150 tons of material per day, a large part of which is being painted with this paint, and it is quite necessary to arrive at some conclusion at once as to what is to be done on the rest of the lock gates, as well as the parts already painted with bitumastic solution.

If the manufacturers can not promptly demonstrate that they can furnish a paint which will withstand our climate, it will, of course, be necessary to give up the use of this material and substitute red lead or some other paint in place of it.

This letter is written in case the cablegram did not make the matter entirely clear and also to enable you to take up the subject intelligently with the manufacturers and Contractors.

In a report of Col. Hodges, dated December 2, 1914, on this claim, he states (see p. 9, vol. 33-A) :

(c) Page 50, as to the cleaning of the interior of the leaves: Much of this, which would not otherwise have been required, was made necessary by allowing the girders to stand around so long after delivery and before erection. This was due to the diatry methods of the Contractor. It was especially noticeable at Gatun, and is sufficient to account for any excessive cost of the cleaning there over what was done elsewhere.

The Contractor states that much of the cleaning was due to the inefficiency of the shop coat of bitumastic solution called for in the specifications. The latter require the shop coat of paint to be bitumastic solution for the interior of the leaf and red lead for the other surface. They also require that "If at any time before erection any part of the coated surfaces becomes so injured by the weather or otherwise as to require recoating, this shall be promptly done free of charge \* \* \*." The contractor was therefore put upon notice both as to the character of the paint and the duty to keep the surfaces protected.

There was a dispute as to the cleaning of certain of the leaves, which was settled in the main in favor of the Contractor. One of our inspectors proved to be at fault in the matter and was discharged. The requirements, however, were not, with the above possible exception, enforced more strictly than they should have been, so far as I know. The matter was often the subject of question between our force and the Contractor, but in the other cases the Contractor's complaints were not considered well founded.

Mr. Guynn, in his report of December 15, 1914, to Col. Hodges, states (see p. 10, vol. 33-A) :

The inspectors were not unreasonable, nor did they require unnecessary cleaning on the interior of the gates. Further details will be given later.

On pages 18, 19, 20, and 21 of his report (vol. 33-A), Mr. Guynn gives further details relative to the claim for excess cleaning. These pages are quoted below for easy reference:

Referring to paragraph (c), page 50, "Fourth," have to advise that during the early part of May, 1911, the material for the lock gates began arriving on the Isthmus. When this material arrived at the lock site it was noted that there was considerable rust on some of it, especially the girders and the paint that was applied in shop, in some cases, had disappeared entirely, leaving the material bare, same continuing to rust until repainted. This matter was taken up with Mr. Goldmark immediately, and after the same was investigated it was decided that the material would have to be taken care of in the field. Mr. Gray, the representative of the Bitumastic Enamels Co., whose paint had



been applied in shop, arrived on the Isthmus later, and after a lengthy discussion with Mr Jewel, stated that he would clean and paint all of the material necessary as soon as it arrived at the lock site.

Owing to the fact that the girders were piled five or six high, one on top of the other, and the cranes being busy erecting the gates, it was found impossible to paint the girders that were underneath, other than the chord angles, which were painted, therefore, these girders were not painted and continued to rust until the gates were erected and practically complete.

During the months of June and July, 1912, the Bitumastic Enamels Co. began cleaning the material on the inside of the upper guard gates at Gatun, preparatory to painting with bitumastic solution and enamel, and from the beginning to the completion of the cleaning of these gates Mr. Gray continuously complained of the severity of the inspectors. These complaints being made so often I myself went into the leaves a number of times and found that the inspector was right in not accepting the leaves, dirt and rust being very much in evidence in each case.

Finally the upper gates were painted, inspected, and accepted. Later on, when the paint contractors began cleaning the upper service gates in west chamber, leaves Nos. 35 and 36, they complained as before and to such extent that it was necessary for me to go into the leaves again and make another inspection of all parts that were supposed to have been cleaned. I found the conditions about the same as was found in the upper guard gates—rust, scale, and dirt much in evidence—and after discussing the matter with Mr. Gray, of the Enamels Co., whose men were doing the cleaning at the time, I realized that it would be impossible to obtain satisfactory cleaning, as Mr. Gray stated that it was not up to him to clean the leaves, but up to the McClintic-Marshall Co. I then took the matter up with Mr. Childers, and he stated it was up to the Enamels Co. to do the cleaning. I then informed Mr. Childers that hereafter I would expect the McClintic-Marshall Co. to be responsible for the cleaning and that I would not consider Mr. Gray further in the matter.

After considerable correspondence and wrangling between the Bitumastic Enamels Co. and the McClintic-Marshall Co. as to who should clean the interior of the gates before applying the bitumastic compound I was informed by Mr. Childers that he would take charge of the cleaning of the gates thereafter. After the Contractors took over the cleaning of the leaves Mr. Gray seemed to have changed his mind in reference to the cleaning and informed me that he would not apply his compounds over any other paint or uncleaned surfaces, and would expect the gates to be thoroughly cleaned when passed by the inspector.

Owing to the length of time that the material was on the Isthmus, especially at Gatun, and with no cleaning or painting during the entire erection, or until the gates were practically completed, it can be readily seen that the material as a whole would be in a bad condition after being subjected for more than 12 months, without protection, to the climatic conditions of the Isthmus. When the Contractors began cleaning the leaves there was considerable rust and scale throughout all of the leaves, and the top sides of the girders were badly pitted.

Much difficulty was experienced in getting the Contractors to clean the material, which caused the inspectors to make frequent trips in the leaves, when once would have been sufficient if it had been cleaned properly. The inside of the leaves is extremely hot, and with a large number of negroes in it made it very disagreeable, and if anyone would stop to think they would realize the inspector would much prefer to pass or accept the work on his first trip than to have to go through the same performance three or four times before accepting.

Experience has shown that the greatest care must be exercised in cleaning the interior before applying bitumastic compounds; furthermore, after compounds were applied it was necessary to reinspect the entire interior very carefully in order to find out if there were any blisters or blemishes. I myself went into the leaves, Nos. 39 and 40, several months after the leaves had been entirely completed and found serious defects in the enamel which required correction, due, in my opinion, to applying the enamel on damp or wet surface. The inspection of the leaves involved tedious and conscientious work. It would have been very much easier to pass work with merely a nominal supervision, but if the rusting of the steel was to be prevented there must be no weak places in the coating at any point. I also found that unless the cleaning was very thorough and care taken to avoid applying the coating to a wet or greasy surface that we could not get satisfactory results; therefore I do not believe that the inspectors required more cleaning than necessary, and statements made by the Contractors to the effect that the inspection test was that the inspectors



would rub their hands over the surfaces, and, in the event of soiling, work was rejected, is absolutely without foundation.

Referring to paragraph 4, page 6, in reference to the rejection of leaf No. 6, as to cleaning, will refer you to Col. Dixon's report to the chairman and chief engineer in connection therewith.

Referring to the difference in cost of cleaning the Contractors had to do at Gatun, will advise that some of the material was very rusty when it arrived at Gatun, and it was not protected during the entire erection period; while at Miraflores the material was in good condition when it was delivered and was erected very quickly, and in the interim the leaves, during erection, were cleaned occasionally of all débris, bolts, washers, etc., while at Gatun this was not done. The climatic conditions are much worse on iron and steel on the Atlantic side than they are on the Pacific side, consequently it can be readily seen why the cost was greater at Gatun than Miraflores.

Mr. Hess, the foreman of the Contractors at Gatun, cleaned the first set of leaves, as stated in pages 67 and 68 of volume 17 of testimony, quoted below:

Now, I want to take up the cleaning. Did you do any of the cleaning of any of the leaves?—A. I cleaned the first set out.

Q. You cleaned the first set out?—A. Yes, sir.

Q. How did you find them?—A. Well, of course, it was rusted some; that is, the water getting down. It was not eaten, or anything like that; it was just the amount of burrs, and water had got on there. And we had to scrape them—that is, the lower set—where the water all went down, and later I had to scrape it.

Q. Did you have very much cleaning to do on those first leaves?—A. Well, not so much; that is, after we got the burrs and everything like that out.

Q. How long did it take you to clean those leaves; do you remember about how long?—A. Oh, well, I had men in there, I guess, for three weeks cleaning out; that is, a few men.

Q. How would the inspectors inspect that cleaning?—A. They went all over it with their feelers and knives, and wherever they could pick a scale, or anything like that, it all had to be taken off.

Q. They went inside of the leaf with a candle?—A. Oh, you bet, they had the candles—electric lights. If the electric light would not show it, why, they lit a candle to get in far enough.

Q. Did you ever protest that you were being required to do too much cleaning?—A. Well, I told them I did not think it was necessary to clean all the—that is, the paint, or anything like that, off. Of course, if anything was scaled I took it off.

On pages 55 and 56 of volume 32 Mr. Childers gives his view of the claim for cleaning:

Q. Page 60 of the claims, Mr. Childers (last paragraph, recleaning leaf No. 6); what can you say about that occurrence?—A. That statement practically covers what occurred. I went through the leaf with Col. Dickson at the time he made his inspection. The only thing they found to which any exception on earth could be taken—except a little dust in the corner—was the air-chamber girder, the scuppers that drain that; the dust and dirt had not been cleaned out of the scuppers. That was below the air-chamber girder. Possibly Col. Dickson made a report on it.

Q. The top of page 61, first paragraph: The method of inspecting the leaves for inside cleaning was to rub the hand over the surface, and if it became soiled the leaf was rejected. Do you know that to be correct?—A. Only from the statement of our foreman in charge of the work. I never was there when they were inspecting a leaf; but I have no reason to doubt that it is a fact from the look of the leaf they turned down.

Q. Do you remember anything about the first coat of paint which was put on the inside of the work at the shop called the bitumastic solution? Did you consider that that paint would stand up under the water?—A. It stood up very poorly here; it took only a short time after water settled on it to rust right through. The bottom girder of each leaf was painted with red lead; on top of that went a coat of cement. If all that material instead had been painted with red lead there would not have been much cleaning required.

Q. Do you remember the condition of the bottom girder?—A. We had very little trouble in cleaning the bottom girders.

Q. Do you think there would have been much cleaning to do if the interior had been painted with red lead?—A. Very little.

Q. You notice on top of page 61 of the claims the expenses that this cleaning caused the Contractor and the wide difference in cost between what was done on the Pacific and Atlantic side, between Miraflores and Pedro Miguel, compared to Gatun. How do you account for that?—A. By the inspection. The reason I say that right offhand is that after the work was completed at Pedro Miguel we brought the man doing the cleaning to Gatun and he could not hold the job at all.

Q. Did you consider that the leaves at Pedro Miguel were in as bad condition as at Gatun?—A. Yes. I believe the erection was commenced at Gatun about the middle of May, 1911, and we commenced at Pedro in August of that year, and the leaf was standing at one place as long as the other at the time the cleaning was commenced.

In relation to the cleaning Mr. Wright stated on page 132, volume 32:

Q. On the cleaning of the leaves, Mr. Wright, quite a lot of money was spent at Miraflores; do you know the cause of that cleaning? Of course you had to take the rubbish out of these leaves?—A. I was supposed to clean the leaf, and we did clean it, and overcleaned it, and we should have got through with about half of the cleaning we did, because the steel was not dirty.

Q. Was it rusty?—A. There was not very much rust.

Q. Do you remember anything about the condition of the red-lead paint?—A. Most of the inside was painted with bitumastic solution except the bottom girder.

Q. Was the red lead in better condition than the bitumastic solution?—A. I believe it was.

Q. On page 61 of the claims, middle of the page (cleaning caused by bitumastic paint), how is that with respect to the material at Miraflores?—A. I never paid much attention to it. There were rust places up there, and I notified Mr. Howe, the inspector, and they were painted before it went down in there with that black stuff.

Q. Do you know how often that happened?—A. No. I didn't have much trouble with the painting at Miraflores; just a few pieces.

Mr. WOLFEL. To give an idea of the cost of the painting at Miraflores, the 28 leaves cost \$17,551, or \$627 per leaf. The 28 leaves have 440 compartments, and they are 4 feet 6 inches high; that makes the area to be cleaned per compartment, allowing for 220 square yards, 440 compartments, into \$17,551, makes about \$40 per compartment; therefore the cleaning costs about 18 cents per square yard, and at the rate those colored fellows work—they got 16 cents per hour—it took one and one-eighth hours to clean 1 square yard; at that rate it would have taken about 16 days to clean the floor of this room.

On page 134 Mr. Wright states:

Q. In regard to cleaning the inside of the gate leaves, you stated it could have been done for half what it costs. In what way was the cleaning required, in your opinion, in excess?—A. It would have to be absolutely inside and clean. Every little obstacle taken out.

Q. By wire brushes?—A. Wire brushes and whisk brooms. We never used a great many wire brushes, because we did not need them.

On page 139 Mr. Wright states:

Mr. ROUSSEAU. At the top of page 61, Mr. Wright, the first paragraph (method of inspecting leaves for inside cleaning), was that method followed at Miraflores?—A. That's the way the inspectors most always did when they got inside of it, to tell whether it was dirty or not by rubbing their hands over it to see if it was dirty.

Q. And if the hand was soiled the leaf was rejected?—A. Sure it was rejected.

Q. How many instances of that do you recollect?—A. Well, on various leaves the inspectors came out and would say the leaf was not clean. I would put the gang right back and clean it with white men whenever the inspector would say.



Q. Were you ever down with the inspector?—A. I went down with him through the leaf several times.

Q. How do you say he inspected it?—A. When he got inside the leaf he would rub his hand on the bottom and A frame and up on top, and if his hand had dirt on it the leaf was not clean.

Q. What degree of dirt? Any appreciable amount of dirt?—A. I did not pay much attention to that. If his hand was soiled or dirty the leaf was dirty. My own hands were pretty dirty climbing over the ironwork and I would take some waste along.

Q. Did you ever see the inspector test the cleanness of the metal by rubbing waste on it?—A. I never saw him do that. I have taken him down in several leaves on the 82-foot leaves and he told me it was not clean. But I did not see any dirt.

Q. Do you know the names of the inspectors or any of the inspectors?—A. I don't remember the name of but one or two on the Isthmus that inspected the cleaning. There was a little fellow from Newport News, but I don't remember his name or the names of any inspectors except one or two. I think the name of the inspector who inspected for cleanliness was Oppell or something like that.

On pages 104, 105, and 106 of volume 32, Mr. Dumville gives his view as to the amount of cleaning that was required:

Q. Now turn to page 60. At the top of page 61 it says: "The method of inspecting the leaves for inside cleaning was to rub the hand over the surface and if it became soiled the leaf was rejected." I think we have told the committee that referred to the work at Gatun, and I believe Mr. Childers testified here that one of his foremen had stated that was the method. The leaves at Gatun were most thoroughly cleaned, were they not?—A. They were cleaned as good as we could get them.

Q. And if the man's hand became soiled when it was rubbed over the surface the work was rejected?—A. If a man rubbed his hand over the surface it certainly would get soiled.

Q. It could not be that clean as not to soil his hand?—A. No, sir. The only way to bring steel to that state would be to have it polished.

Q. I am told that was nearly done.—A. No, sir; they were not polished.

Q. Do you not think you could clean a piece of iron with wire brushes and small brushes, and even then when you rubbed you hand over it it would be soiled?—A. You could not clean a piece of rough steel so as not to soil the hand; no. It would soil it to a certain extent.

Q. You remember the specifications state that the bottom girders shall be painted with red lead?—A. Yes, sir.

Q. Do you remember the condition of those girders?—A. You mean inside of the gate where the concrete bottom was? That was not coated with red lead.

Q. Paragraph 105 of the specifications says that the interior will be painted with a solution of bitumastic enamel, and that an exception shall be made in the case of the girders at the bottom of the gate, which shall receive a thin coat of red lead, which shall later be replaced by a cement covering, which shall be applied as specified therein.—A. What I referred to was the interior side of the bottom girder; the top side was not painted in the field.

Q. I mean at the shop; it came to the Isthmus painted.—A. I can not say. I would not swear whether it was painted with red lead or with bitumastic.

Q. Do you know the condition of that girder with respect to rust and also to the amount of paint on it in connection with the other girders painted with bitumastic?—A. The bottom girders required considerable cleaning, due to several reasons. The entire rubbish in the interior of the gate collected in the bottom girders. That had to be removed, of course. In some instances there was rust, but in all instances there were big quantities of dirt, because the entire rubbish came down and collected on the bottom girder. The bottom girder was cleaned and the cement covering was applied to the bare steel.

Q. Do you think the bottom girders were rusty?—A. In some instances.

Q. Do you think it was?—A. Yes.

Q. Were any of the other girders rusty?—A. Yes, sir. The interior of all the leaves were rusty. That is, the principal girders. The last leaves shipped from the States—the last material shipped from the States, I should say—had considerable less rust than the first ones.

Q. Do you remember the paint on the outside of the leaves when they came from the States?—A. They were in good condition and stayed in good condition until they were finally painted. That was red lead.



Q. How about the outside of the gates?—A. The outside of the gates required very little cleaning before they were finally coated with red lead. That is, the first coat. We applied two coats of red lead, but there was little to do to prepare the surfaces; the shop coat of red lead was very good.

Q. And it seems that the black solution which proceeded the enamel was just rotting away?—A. In some instances the shop coat of paint was entirely gone.

Q. Did you ever notice when shipments arrived from the States that the shop coat was gone at that time, and the iron was commencing to rust where painted with that black solution?—A. I would not go just that far; no, sir. I can state that the material stored in the yard was rusty, and some of it badly, prior to its being installed in the leaves. I would not like to say how long it had been since that material had been received on the Isthmus.

Q. You will remember that on November 13 there was a dispute about inspecting a leaf on the lower level at Gatun, I do not remember the number of it, but that at Mr. Childers's request I took the matter up with the chairman and he appointed Col. Dickson to inspect the leaf?—A. About cleaning?

Q. Yes; cleaning.—A. Yes; I remember that.

Q. Do you know whether Col. Dickson made a report?—A. Yes.

Q. Do you know about the date of that report?—A. The investigation was held about the 1st of November, or somewhere around the 10th or 15th of the month, if I remember rightly, and I saw Col. Dickson's report several days after that. I can't say just what date it was.

Q. Do you remember anything stated in the report as to the method in which that cleaning was carried on, as to whether it was thoroughly done? The Contractor was never furnished with a copy of it to my knowledge.—A. I do not know that I can quote the report, but I can say what was the nature of it. Mr. Childers claimed that we were absolutely too rigid and unreasonable in our demands for cleaning.

Q. Do you remember anything about the method of inspection?—A. That was what I was going to say. The reason why the argument arose was that the inspectors turned down a portion of the leaf on account of its not being properly cleaned, and Mr. Childers's men referred the matter to me, and he went into the leaf, and I also went into the leaf, but I did not see him in there, as he came out of the leaf in a different direction. Mr. Childers told me later, and also Mr. Gynn (we were together at the time), that he would not do any further cleaning on the leaf, and that he would take the matter up with Col. Goethals, and the matter stood like that for some while. I went into the leaf, and told Mr. Childers that, with the exceptions which I called his attention to, the leaf was all right, but that it would be necessary for him to do that other cleaning, and he refused to do it, and the next we heard about it was that Col. Dickson would be done to investigate it, and Col. Dickson went into the leaf with Mr. Childers, myself, and Inspector Quinn. Col. Dickson examined the spots I called his attention to, and then he went out of the leaf and went into the machine-shop office, and Col. Dickson held an investigation there, and examined a few people in connection with the cleaning. Col. Dickson's report was to the effect that the exceptions that I had taken were properly taken, and that the different places I pointed out should have received further cleaning, and that all the grease and dirt and rust should come off before the painting was done. He also stated in his report that the cleaning was being very well done. I think he said that Mr. Childers was being made to go to the limit in cleaning, and that with the exceptions of the spots I pointed out the leaf was remarkably cleaned. Mr. Childers also claimed that the inspectors were not cooperating with him in trying to get the work done; that our men looked at a little of it, and if they found spots told them to have it cleaned for several days, and that they would come around and look at it again.

Mr. Howe testified as follows about the cleaning (see p. 75, vol 32) :

Q. What was the amount of cleaning and the way it was performed on the interior of the lock gates before applying the final coating of bitumastic?—A. The leaves had to be, every girder had to be thoroughly cleaned, started at the top and went right straight down to the bottom.

Q. What methods were required? What was the Contractor required to use?—A. Wire brushes. They used wire brushes and brooms.

Q. Was any complaint made in regard to the amount of cleaning required?—A. No; once I believe I had to go down myself in one of those bottom girders, but the matter was adjusted easily enough.



Q. Was the cleaning due primarily to the operation of the Contractor? Some cleaning would have had to be done anyway. Or was it necessary to remove the first coat of the bitumastic solution?—A. No; it wasn't necessary to do that. You see the stuff at Miraflores had come down there; the last that was shipped from the States had received a coat of this solution. It wasn't in nearly as bad shape as at Pedro Miguel.

Q. What was the cleaning primarily necessary for?—A. To clean out the bolts and rivets and old rivet kegs and such stuff as that.

Q. That would have had to be done anyway and would have no reference to the bitumastic solution that was on the steelwork. There was no special increased cost, in your opinion, due to any imperfections in the painting?—A. In the previous painting?

Q. Yes, sir.—A. No, sir; I don't think there was.

Q. At either Pedro Miguel or Miraflores?—A. At Pedro Miguel I wouldn't state.

Mr. SMITH. When did they stop using that bitumastic solution, Mr. Sterrett?

Mr. STERRETT. They never stopped at all. There was a letter written by Mr. Hammer ordering them to stop, but they continued again. They abandoned the field coat and used bitumastic enamel all the way through. Mr. Smith, when the trouble arose whether the paint was durable or not, then, I believe, Mr. Hammer wrote a letter requesting them to stop. The matter got to the Isthmus, and it was decided to put that coat of enamel all over the inside, and they went ahead and put on the solution just the same as before.

Mr. SMITH. What was the method of inspecting and cleaning inside of the leaf; whether it was cleaned sufficiently or not?

Mr. HOWE. It was gone over to see if it was clean.

Mr. SMITH. Didn't rub your hand over it to see if it was clean?

Mr. HOWE. No, sir.

Mr. STERRETT. That was intended to apply only to Gatun.

Q. (Mr. ROUSSEAU to Mr. HOWE.) Was the Contractor's work at either Pedro Miguel or Miraflores delayed or held up appreciably, in your opinion, due to an insufficient number of inspectors or the way they carried on their work at any time?—A. No, sir.

On pages 83 and 84, volume 32, Mr. Howe also stated:

Mr. ROUSSEAU. You were questioned, Mr. Howe, about extra cleaning on these Miraflores leaves. Refer to page 81 (g). In other words, for Miraflores and Pedro Miguel we do not claim excess cleaning due to inspection, but we do claim, on account of rust and the paint disappearing, we had to do more cleaning than necessary.

Mr. ROUSSEAU. But Mr. Howe made the explicit statement that none of the cleaning was due to deterioration of paint.

Q. Can you give any further details in regard to that? Read that statement and make any comment on it.—A. As I stated before, the work shipped for Miraflores had received a coat of this bitumastic enamel before it came down; not the enamel, but the bitumastic solution.

Q. All of it had?—A. No; some of it was down at Miraflores. Wasn't there two or three girders that hadn't been done in the States and had to be done down here? To Guynn.

Mr. GUYNN. Not to my knowledge.

Mr. HOWE. I know in several cases we touched up some gates.

Mr. ROUSSEAU. How many gates did you go in yourself to inspect the cleaning either before or after to inspect the condition of the paint?

A. Before final acceptance?

Q. No; before the cleaning, and to inspect the cleaning after it had been done.—A. I have been in most every gate.

Q. And you made a positive statement that the cleaning was not due to deterioration of the bitumastic solution.—A. I won't make as big a statement as that, but I will say that the condition was nothing like what it was at Pedro Miguel. There may have been rusted spots and things like that that were cleaned off with the wire brushes.

Q. You do not consider it increased the cost of the cleaning appreciably.—A. No, sir; it had to be cleaned anyhow.

Q. Read pages 60 and 61, Mr. Howe, starting at the top of page 60.—A. That refers particularly to Gatun.

Q. At the top of page 61. It cost \$627 per leaf to clean at Miraflores and \$621 per leaf to clean at Pedro Miguel. Have you any comment to make on the matter of cleaning?—A. No, sir.

Mr. SMITH. Do you remember about how many, how large the spaces were that would be rusted; that had to be cleaned by wire brushes?

A. Most of it was on the plate part of the girder and the rivets, shop rivets—that is, the shop rivets. On most every girder there were a few rust spots.

Q. It was not a case of cleaning rust off the entire girder by any means?—A. Oh, no, sir.

The manner in which the cleaning was done at Gatun, and the way in which the amount of cleaning was affected by the inefficiency of the bitumastic solution, is shown in the testimony of Mr. Dumville taken at the Isthmus, volume 32, pages 116, 117, and 118, which, for easy reference, are quoted below:

Mr. ROUSSEAU. In regard to the matter of cleaning the interior of the leaves. What was the general method followed at Gatun by the Contractor; what method of cleaning?

Mr. DUMVILLE. The Contractor's men cleaned the leaves and submitted them for our inspection.

Q. What did they use for cleaning; what tools, implements, or material?—A. Wire brushes, scaling hammers, steel scrapers, and dust brushes.

Q. Did they use any air at all?—A. They used air, but only to a small extent. They removed some of the heaviest scale with air. Just how far they did this I would not say; I could not give you an exact idea.

Q. Have you any idea what percentage of the cleaning was due to the removal of the bitumastic solution at Gatun and how much was due to incidental cleaning up of the gates?—A. The débris collected on the interior of the gates, and that had to be removed, and it was impossible for it not to collect. That was a result of the working conditions. The material should not have rusted and would never have rusted had it been properly coated. That is a matter of fact. If it had been properly protected, it could not have rusted.

Q. After the surface was cleaned, how much of the bitumastic solution was visible?—A. On the top sides of the girders there was approximately none. On the sides of the sheathing plates in some instances it was very good. In some instances it was absolutely gone; that is, on many of the first leaves.

Q. On page 61 is a comparative statement of the expenses said to have been incurred by the Contractor for cleaning per leaf at Miraflores and Pedro Miguel, and at Gatun it is three times as much per leaf as at Miraflores or Pedro Miguel. To what do you attribute that large difference?—A. I would not like to say, Mr. Rousseau.

Q. Why not?—A. Well, I know conditions exactly at Gatun and I do not know them at the other two places. I know exactly what we were required to get at Gatun and exactly what we got. The leaves were very dirty and rusty in a number of instances, and the rust was removed and cleaned. There was some trouble about cleaning one of the leaves, before the McClintic-Marshall people took over the cleaning personally themselves. The other leaves, however, were cleaned and cleaned well. I do not believe that any rust was covered up by the paint.

Q. I will state further that at Miraflores the statement has been made that the bitumastic solution was all in good condition, so that the only difference, then, in conditions would be the rust at Gatun?—A. Climatic conditions at Gatun might also have been a cause. It is claimed on the Isthmus, I believe, that material is more prone to deteriorate on the Atlantic side than on the Pacific side, because of the excessive dampness there, which you do not have on the Pacific side. I would not care to make that as a statement.

Q. The fact of the matter is, that the Contractor claims that one of the causes for the increased cost is due to the inspection being so severe at Gatun, and, of course, there may be other ways of accounting for it.—A. There is one thing about it. If the material at Miraflores was in better condition of course the cost would be decreased. If the material at Gatun deteriorated more than the material at Miraflores during the erection, that would be another reason. I would not care to say that that was the condition. It is possible that the inspection at Gatun was more rigid than at either of the other places, and, if so, of course it cost more. But I did not exceed my orders and we did get a good, clean job. If the cleaning was not done that well at the other places, which I do not know, that would be a cause. I could not say whether it was or not.

Q. While at Gatun do you recall any facts coming to your attention relative to the method of carrying on the work, or methods of erection or any other



factors that might also have gone in and accounted in a general way for the cost of the work of the contractors there?—A. From what source do you mean?

Q. From any source. In other words, was the Contractor's work above criticism, serious or appreciable criticism, or as to the efficiency with which his men performed their work?—A. They would have made better progress had they proceeded with the job on a large scale at the beginning; if they had rushed in their equipment as Mr. Childers did when he came down, they would have made better progress. I do not know whether that is just what you want to get at or not.

Mr. SMITH. In your statement in regard to the cleaning of that one leaf that was objected to by Mr. Childers and that Col. Dickson made a report on. I believe you left the impression that Col. Dickson's report was that the attitude of the inspectors was unfriendly to the Contractor; was that your intention?

Mr. DUMVILLE. The attitude of one inspector was.

Q. You limit it to that one inspector?—A. The objection was made by Mr. Childers against one inspector, and Col. Dickson in his report practically upheld Mr. Childers in his objection to that one inspector.

Q. What was the attitude of the inspectors as a general proposition?—A. I endeavored to have the feeling as good as I could and as friendly as possible. That was my attitude at all times. Of course inspectors on any job like this are subjected to a good deal of criticisms by the contractor, and we had to use considerable diplomacy to keep things running. As a whole, I do not think there was any ill feeling; that is, to any extent. There is one instance that I referred to and which was the subject of investigation. I have heard Mr. Childers express himself in regard to his feelings toward Mr. Quinn and the way he thought Inspector Quinn felt toward the Contractor.

Mr. Robert Mellon, one of the inspectors of the Panama Canal at Gatun, stated (see p. 45, vol. 35):

A. The most corrosion and trouble was on the bottom of the panel. The upper part of the panel never had much trouble. It was at the bottom of the panel where all these metals had laid and the water run in starting much corrosion, and then the floor of the panel, as you might say, that is where most of the cleaning was—all the trouble.

Mr. George Roberts, one of the inspectors of the Panama Canal at Gatun, testified as follows (see p. 53, vol. 35):

Q. What were your requirements as to cleaning?—A. Well, the requirements were pretty severe because iron or steel must be perfectly cleaned if you want the paint to take any hold. Those leaves and rivets in Gatun were there quite a while before same were put up, and the rivet heads got to rusting and thin scale all had to come off. Generally, we scaled with a scale hammer and then had a wire brush to pick up anything that didn't get off with the scale hammer.

He further testified that (see pp. 53 and 54, vol. 35):

Q. You say some of that material at Gatun had been there a long time before they erected it?—A. Yes, sir.

Q. And that it rusted?—A. Yes, sir; the rust had got hold.

Q. Did you ever have any complaint that you were requiring more cleaning than necessary?—A. I have heard several. We could not see where it was to the advantage of the Commission to loosen up on the cleaning.

Q. What was your method of determining whether a leaf had been sufficiently cleaned or not?—A. We used to go around with a candle to examine it.

Q. Did you use your hand to rub on the inside to determine whether there was dirt there?—A. You can generally see that. Sometimes on the floor of a leaf it would look like scale.

Q. It is stated here in the claim that the method of inspecting leaves that you would go down into the leaf and rub your hand on the inner surface of the leaf, and if you soiled your hand you would send the cleaner back in to clean the leaf. Is that right?

A. Not in my case. I never carried it that far, because it was not necessary, and I think the painters carry a brush to knock off the dust, and I used to look at it anyhow.

Q. How many did you inspect before cleaning?—A. I believe nearly all at Gatun, with the exception of the first four—the upper guard gates and those

were cleaned after the 1st of September in 1912. I could not tell you just what leaves they were.

Q. It was also stated in the claim that a large part of the cleaning in the first place was caused by the bitumastic paint called for in the specifications being inadequate to meet the climatic conditions at the Isthmus. What do you know about that? They put a coat of bitumastic solution on the leaves in the States, and do you know whether or not that came off and scaled off to such an extent as to require an unusual amount of cleaning to get them in shape to apply the solution?—A. It must have. As I say, before some of those leaves were erected they were laying in the yard, and the rust had already started on them. And I called Mr. Dumville's attention to it and said it would be a good idea to clean them.

Q. Do you know whether that was done?—A. Yes, they did.

On page 182, volume 8, Mr. Goldmark testified as to the instructions he gave with respect to cleaning the interior area of the leaves before the bitumastic enamel was applied, as follows:

A. Why, these leaves were sand blasted before they were sent to the Isthmus—before they were painted in the shop. For various reasons they got dirty and rusted and covered with debris; and my instructions were to clear them so that practically no foreign substances should remain on them. The discoloration from rust, yes, but no scale; no dirt; no paint except perfect black bitumastic adhere, of which there was very little; and to get a dry, clean surface; to remove all foreign material except paint in good condition.

The evidence established the fact that a large amount of necessary and some unnecessary cleaning was done. It also establishes the fact that a large part of this cleaning at Gatun was caused by the inefficiency of the bitumastic solution in protecting the interior surfaces of the gates from the time the erection of steel began until the gate was completed. It also establishes the fact that a long time elapsed between the beginning of erection of several of the gates at Gatun and their completion, and that they became very dirty and required much cleaning.

Paragraph 108 of the specifications provides that—

If at any time before erection any part of the coated surfaces becomes so injured by the weather or otherwise as to require recoating this shall be promptly done free of charge to the satisfaction of the chief engineer or his authorized representatives.

In no case shall the paint be applied out of doors in rainy, misty, or freezing weather, and all surfaces on which paint is applied must be at the time dry and clean.

This provision in the specifications is ample authority for requiring the leaves to be thoroughly cleaned before bitumastic enamel is applied. It is also apparent from the very nature of the bitumastic enamel that it would be necessary that the surfaces should be thoroughly cleaned before the painting is applied.

Article 12 of the contract provides that—

All questions relating to final inspection and acceptance of the materials and workmanship to be furnished hereunder, or the failure of such materials and workmanship to comply with the specifications, shall be determined by the chief engineer of the Commission, or by any officer or deputy to whom the chief engineer may assign that duty, and such decision, when expressed in writing, shall be final.

This provision of the contract makes the Isthmian Canal Commission's inspectors the judge as to what cleaning is necessary and makes their decision final. In questions of differences between the judgment of the Isthmian Canal Commission's inspectors and the judgment of the Contractor's foremen and superintendents, the



Isthmian Canal Commission's inspectors' actions should be followed unless a clear mistake on their part is established. The evidence does not indicate that the inspectors of the Isthmian Canal Commission were overexacting, except in some few instances.

What seemed to be unreasonably close inspection at the time was probably due very largely to the inadequate shop painting or defects in the bitumastic solution, and also to the fact that the Contractor was a long time in erecting the gates and that they became very dirty.

That part of the Contractor's claim which was based upon the proposition that "On account of the inadequate shop painting \* \* \* the Contractor was required to do unnecessary interior cleaning" is established.

It is also established that in some instances the inspectors made unreasonable requirements, but this does not appear to apply to any appreciable extent to the inspection at Miraflores.

The amount of the Contractor's claim for excessive cleaning, in the way he arrived at it, is about \$78,000, and the amount he concedes as the normal for cleaning is about \$31,000.

Mr. Goldmark, in his report, page 115, volume 1, quoted on page 411 of this report, states:

The use of the bitumastic solution as a shop paint was prescribed in the specifications, the Contractor having no part in its selection, and no option as to whether he would use it or not. A considerable part of the cleaning was made necessary by the poor quality of this paint. Just how much it is impossible to say, but I am inclined to think that if red lead had been used the cleaning at Pedro Miguel and Miraflores would have been reduced by about one-half, and at Gatun by about two-thirds.

If this should be taken as the correct estimate as to the excess cleaning due to the use of bitumastic solution, out of a total of \$109,702.26, the excess for which the Contractor makes claim, including rush work and unnecessarily severe inspection, would be about \$67,000.

The total price of cleaning was \$3.03 per ton at Gatun; at Pedro Miguel it was 99.8 cents per ton and at Miraflores it was 98.9 cents per ton, including the rush work. If Goldmark's estimate should be taken as representing about actual conditions, the cleaning at Gatun should have cost \$1.01 per ton, at Pedro Miguel it should have cost 49.9 cents per ton, and at Miraflores 49.5 cents per ton, including rush work. On the basis of the Contractor's claim the price per ton for cleaning would be 49.9 cents per ton at Miraflores, including rush work, and at Pedro Miguel and Gatun 54.9 cents per ton.

Mr. Goldmark did not undertake to do more than make an estimate. His statement does not take into consideration the increase in cost due to the time that the Contractor took to erect the leaves after beginning the erection. This does not apply so fully at Miraflores as at Gatun, but the claim should be so stated that this element in the claim will be considered in the total allowance. This element is partly covered and included in the claim for rush work, but in order to charge the Contractor with what would seem to be a reasonable amount for him to assume for delay in erecting the work at Gatun the amount to be deducted from the actual expense at Miraflores in establishing a normal should be reduced. It is believed that it would be fair, just, and equitable to fix the deduction for excess cleaning to be made from the actual expenses at Miraflores at \$6,000, exclusive of rush work.

## METHOD OF ERECTION.

On page 49 of the claim, third paragraph "fourth," the Contractor makes this claim in reference to the inspectors:

That they exceeded their authority by prescribing the method under which the work should be erected, and by insisting upon having this method carried out.

On page 50 of the claim, under "(d)," it is stated:

The inspectors at Gatun and Pedro Miguel insisted on directing the order and methods of the successive steps of erection, thus delaying the progress and increasing the cost. At Miraflores the erection was carried on according to the Contractor's own methods.

On pages 58, 59, and 60 of the claim the Contractor undertakes to state the particular way in which, and the extent to which, the cost of erection was affected. The evidence on which the contractor relies in support of this contention is referred to and commented on in his brief, pages 129 to 134, inclusive.

The main differences in the methods of erection at Miraflores and at the other two lock sites was that at Gatun and Pedro Miguel the work was plumbed up and adjusted to the correct alignment provided for in paragraph 121 of the specifications at successive steps in the erection of the skeleton of each leaf, while at Miraflores the skeleton of each leaf was erected complete and then plumbed up and adjusted to the correct alignment.

Paragraph 121 of the specifications provides that—

121. In both shop and field erection the utmost care must be taken to get the skeleton into correct alignment before any sheathing is bolted to it or rivets driven. The vertical distances between adjacent horizontal girders must not vary more than one-sixteenth inch from the dimensions shown on the plans. The vertical ends of the leaves must be kept straight from the top to the bottom, so that the bearing plates on the quoin and miter posts may be truly in line and make proper contact. After the structural work is completely assembled and riveted up, the end plates shall be planed to a true surface. In the field erection the separate parts shall be tightly bolted together, using bolts in practically all of the holes, and the rivet and bolt holes shall then be reamed out to their full size. In attaching the castings, the holes in the structural work must be drilled from the solid to fit finished holes in castings. All necessary precautions must be taken in driving rivets to avoid the distortion of the gate as a whole and of any of its component parts.

Rivets must be tight under the hammer and where necessary must be calked to make them water-tight, but may not be recupped. Calking of plates and angles must be done with great care, with approved pneumatic or other satisfactory tools in such a manner as not to injure the material in anyway. (See also par. 123 of the specifications, quoted on p. 270 of this report.)

In reporting upon this part of the claim, Col. Hodges stated (see p. 9, vol. 33-A):

The claim (d) that the inspectors exceeded their authority by prescribing the method under which the work should be erected is new to me. I find nothing to sustain it in our records. Paragraph 118 of the specifications provides that the Chief Engineer shall approve the erection plans. It is well known that the erection methods first pursued by the contractor did not accomplish good results, but soon the actual placing of the skeleton showed marked improvement. Any action of our inspectors which was justly considered by the contractor as exceeding their authority in prescribing the method of erection would certainly have been corrected by you or by me at once had it been brought to our attention at the time. It is rather late to take it up now.



Mr. Guynn stated in his report, pages 17 and 18, volume 33-A, in relation to paragraph (d), page 50 of the Contractor's claim, that:

Referring to paragraph (d), page 50, "fourth," relative to inspectors insisting on directing the order and methods of successive steps of erection at Gatun and Pedro Miguel, and not at Miraflores, have to advise that at Gatun and Pedro Miguel that the inspectors did not insist on the way the erection should be accomplished other than demanding that the leaves at the different adjustment panels be checked. In reference to the Contractor's methods being used at Miraflores, wish to state that Mr. J. O. Childers and I talked the matter over a number of times, Mr. Childers stating that he believed he could erect the gates as a whole and accomplish the work much quicker than the old method which had been followed. I informed him at that time I believed it could be done, provided care was exercised during the erection, and I also believed satisfactory results could be obtained. I informed him at that time I would assist him every way possible as I was desirous of seeing the work completed at Miraflores in much less time than the gates at Gatun and Pedro Miguel required. (See my comments on the 3d paragraph, p. 49, "fourth" of Contractor's claims; see p. 11 of this letter.)

In reference to the method of erection followed by the Contractor, Mr. Goldmark in a letter dated July 2, 1912, General Exhibit No. 7, introduced in connection with the testimony of Mr. Pendergrass, volume 15, stated:

On Saturday, June 29, leaves 37 and 38 were brought together against the sill. These leaves have been erected slightly out of plumb at the miter ends. The miter posts lean downstream at the top slightly. Both leaves, fortunately, lean the same amount, and the entire bearing is wonderfully true and correct from top to bottom.

There is the utmost need for haste in closing the gates, as the lake level is now over 30 feet, while, as you know, the level of the emergency dam just above the gates is 37.3.

The work so far as it has gone is entirely satisfactory. As to the method of erection, it is perfectly correct in principle, but the management has been in many ways execrable, so that, so far as riveting, reaming, and finishing are concerned, we are, as you are aware, away behind our schedule.

This same letter contains the statement that—

Mr. Guynn stated that he had never seen more perfect preliminary tests than these.

This shows that whatever may have been the method adopted by the Contractor and whether it was adopted at the suggestion of the Isthmian Canal Commission's inspectors or not, the results obtained were entirely satisfactory and accomplished the purpose contemplated by the contract in a highly satisfactory manner.

In his report, volume 1, pages 101 to 107, inclusive, Mr. Goldmark gives his recollections as to the character of the inspection so far as it applies to this particular claim of the Contractor:

*Claim 4 (c).*

It is claimed on page 49, "That they (the inspectors) exceeded their authority by prescribing the method under which the work should be erected, and by insisting upon having this method carried out."

This charge is referred to more in detail on pages 58 and 59, in which some extracts from reports of Mr. J. O. Childers, general superintendent for the Contractor, are given. These reports are, in my opinion, incorrect and misleading. They do not take into account the conditions under which this work was done, and give an entirely distorted view of the situation and the demands made of the Contractors. It would appear from these that during the whole process of the work the Contractors were impeded from doing economical and good work by the action of the inspectors. As a matter of fact, this is not true.



The Contractors originated the method of erection which was approved by the chairman of the Commission, and this was followed throughout in all its essentials. The only point in which the original method was changed was the following: As originally planned and described by Mr. Jewel in his letter to Mr. Hammer on the method of erection, dated November 8, 1910, Isthmian file No. 5-A, so-called triangular erection frames, or false-work frames, were intended to be fastened to the gates as they were erected, and keep the gates from falling over, from the very beginning of the work. These frames, when fastened to the gates, were strong enough to carry the whole weight of the gates, and served to roll the gate into position over the pintle. In the erection of the first leaves at Gatun, it was found that if these frames were attached to the gate before the sheathing was put on, it was very hard to insert the sheathing between the frames and the gate. The method caused great delay, and in the next set of leaves, or the third set of leaves, these frames were not attached to the gates until they were almost fully riveted up and ready to be shoved over the pintle. The skeletons of the gates were kept from overturning by steel guy ropes attached at the top, and in most cases at one intermediate point. This method proved safe and efficient—in fact the change was almost absolutely necessary. No question has ever been raised about this. I have understood that this method was originally suggested to Mr. Jewel by Chief Inspector Guynn.

When the erection began at Gatun, both the Contractors and our inspectors were inexperienced in the special points connected with the erection of these gates. I do not believe anyone in the Contractor's force had been present at Rankin while the sample leaf was erected there. Mr. Guynn had been present at Rankin when this leaf was erected, and was familiar with the difficulties encountered, and the steps taken to get over them in the erection of the leaves. He was therefore entirely willing to assist the Contractor by giving him the benefit of his experience. As I recall it, the Contractor's foreman, Mr. Hutzley, objected to any assistance of this kind, and it was not urged.

I did, however, urge upon the Contractor, and also upon Mr. Guynn, the importance that these and all other leaves should be erected plumb and straight, as required by the specifications. Difficulties were encountered from inexperience in knowing just how to place the girders and diaphragms so as to get the ends of the girders and diaphragms to match exactly and to build up the gates to a true line. There were also, of course, a number of other points that gave difficulty in the beginning. However, the inspectors so far failed to insist on any special precautions and methods of erection on these first eight leaves as to fail in their duty rather than to exceed their authority. I continuously urged Mr. Jewel to make sure that these gates should be completed accurately, and he assured me that all precautions were being taken to that end. However, I do not believe that they were checked by plumbing for a considerable time by the Contractors, and various obstacles were put in the way of the inspectors making this check by a plumb line—such as scaffolding and other obstructions. The result was that when these gates were completed, that is, nearly riveted up, and I insisted on making this check, that is, in doing just what the Contractor now says we should have done—let him finish his gates and then see whether they were right—it was found that they were quite decidedly out of plumb. Referring to Mr. Guynn's report to me of January 2, 1912, it may be seen that the condition of these leaves were as follows:

“Leaf No. 37. Upper guard gate, Gatun, quoin end vertical, miter end leaning downstream  $1\frac{5}{8}$  inches.

“Leaf No. 38. Upper guard gate, Gatun, quoin end vertical, miter end leaning downstream  $1\frac{7}{8}$  inches.

“Leaf No. 39. Upper guard gate, Gatun, quoin end vertical, miter end leaning downstream  $1\frac{1}{4}$  inches.

“Leaf No. 40. Upper guard gate, Gatun, quoin end vertical, miter end leaning downstream seven-eighths of an inch.”

It is to be noted that the quoin end had been pulled to a vertical position by guys, so as to be able to judge what the condition of the other end was.

Some other measurements made seemed to indicate even greater divergence from the vertical line at the miter end. I do not think that these figures have ever been denied by the Contractor. The leaves at that time were riveted on the downstream but not on the upstream side, but it proved impossible to improve them. They remain now as they were then, somewhat out of plumb. It should be noted that all ends leaned the same way. This being the case,



the slight difference from a vertical line is not important, though it should be noted that the different leaves in the same pair do not lean the same amount. However, by good fortune the two leaves in a pair leaned the same way—both downstream. If they had happened to have leaned one upstream and the other downstream, which might just as well have occurred, the mitering surfaces in these leaves would have been permanently very bad. In other words, the leaves would have intersected somewhere and diverged further and further from the point of intersection. The bearing would probably not have been tight, and the work entirely unsatisfactory.

As a result of these errors I gave instructions that from then on a careful check should be made continuously by the inspectors, in order to insure that when we got through with a leaf it should be plumb. Mr. Jewel agreed to this, and I believe the understanding was that twice a week a plumb bob should be placed at the ends for checking. This, however, was not done, and there was considerable trouble in getting the plumbing done and, in my opinion, many times considerable risk of getting the gates out of plumb. I believe, however, that by watching them most carefully the inspectors succeeded in getting them all plumb. I notice in Dumville's report, February 1, 1912, the following:

"The alignment of the ends of leaves 33-36 at the time the top girders were placed in position showed them to be plumb. Contractors promised to replace plumb bobs used in erection when the last top girder was placed in position on January 20. Until this is done I can not take accurate check."

I would also note that on the next set of leaves to the upper guard gates, I believe girder leaf No. 33 at Gatun, the erection of the first 5 or 6 girders was faulty. The ends of the girders were not in line. The A frames projected in some cases. These girders had been rushed up in a great hurry, regardless of all protests, as Mr. Marshall was then expected on the Isthmus. It was claimed at that time, in the presence of Mr. Marshall and Mr. Jewel, that these girders were all right. The girders did, however, prove to be faultily set and were taken down as far as the bottom girder and rebuilt by the Contractors.

The work continued at Gatun for a long time, and the Contractor's superintendents and foremen were changed several times, and the men in charge of the gangs quite frequently. The only men who were there continuously and were fully posted with all the difficulties in getting these good results were, as a matter of fact, the inspectors. They had from me instructions not to act as foremen, not to direct the methods by which results were to be attained, but to check the results after the work was done. It is manifestly impossible to accomplish this exactly so as to wait until the work is entirely done—until serious errors have been introduced into the work which can not afterwards be corrected. The errors of the erection of the first girders as given above show this. I do not understand that there was any desire on the part of the Contractor to change the method at Gatun until very much later. In fact, I do not now recall that Mr. Childers's desire to change it at Gatun was mentioned to me at that time, nor do I know whether Mr. Dumville at that time objected to a change. At the time the Contractors had reached this stage of erection they had naturally learned a great deal about it. There is no doubt that the Miraflores work was handled by them very much better than the other work. It would have been strange if it had not. If at that time they had arrived at a better method for erecting the gates, placing them properly and plumbing them into line at the ends, there was absolutely no objection by our inspectors to a change in method.

There was one chief inspector, and I do not believe that he used different methods in one place than in another as to directing the method in which the work should be done. As to Mr. Dumville personally, I always found him extremely reasonable, so that I would not have supposed it probable that he would make an unreasonable demand, nor do I think the chief inspector would have objected to the use of a method at Gatun which gave good results at Miraflores. I would refer also to a letter which I wrote to Mr. Guynn November 9, 1912, file 84-C-81, part 10, in which I instructed him to be careful not to have his inspectors handle the work; that is, act as foremen.

In connection with this whole matter, I want to put myself on record as emphatically as I can that the inspectors did not hamper this lock-gate work, but from the beginning to the end of the same were of the very greatest assistance to the Contractors in getting the work together in a proper manner and avoiding delays. There were many points in which the experience of the inspectors in water-tight work was of the greatest value, while practically none of the Contractor's men had such experience, and as far as I could judge from



observation extending over several years, all the information that we had was put fully and fairly at the Contractor's disposal. I know that this was done with much tact and good will, and I saw no evidence that any attempt was made to coerce them into methods that they objected to or to take charge of the work.

With reference to claim 4 (c) attention should be directed also to the following letters:

[File 17, No. 3.]

January 31, 1912. Dumville to H. Goldmark, giving errors permitted in the ends of completed leaves. This letter is accompanied by a sketch showing the exact condition of the end-plate surfaces in leaf No. 38 at that time.

February 9, 1912. H. Goldmark to Jewel, regarding plumbing of gates.

February 26, 1912. H. Goldmark to Jewel, same subject.

February 28, 1912. Jewel to Courter and Hess, same subject.

The evidence establishes the fact, as stated by Mr. Goldmark in the part of his report quoted on page 435 of this report, that at Gatun and Pedro Miguel the leaves were frequently plumbed up, and that this action in plumbing up did result in delay and inconvenience to the Contractor. (See testimony of Mr. Courter, pp. 15 to 23, inclusive, vol. 16.)

Mr. Courter was asked the question as to whether or not the difficulty that they had in erection was due to the fault of the work or to the way it was put together and answered this question as follows (see p. 23, vol. 16):

No; it was not the fault of either one; it was the fault of the inspectors saying it was out when there was not anything wrong with it. I should not say that there was anything wrong with it; it went together without any extra work or any fixing or any new pieces being furnished. We did not have any new pieces to take the place of it; it went together all right, and was all right, and is all right to-day, so far as I know. I ain't heard anything about its leaking or falling down.

On pages 82 and 83 Mr. Courter testified about erecting some gates without waiting for the inspectors to plumb them up. He said the inspectors objected to it because they would not get the gates true by running them up so fast, and it did not give them a chance to plumb them. Mr. Courter stated that "they plumbed themselves." He stated that he ran up four leaves in about two days. His testimony is to the effect that it took much longer to run up the first leaves at Gatun.

The other testimony cited by the Contractor in his brief supports the proposition that it did take longer to erect the leaves by plumbing them up at successive intervals than it did to erect them in the way they were erected at Miraflores.

The Commission's inspectors, under the instructions of Mr. Goldmark, undoubtedly did insist upon making a thorough inspection of the leaves as they were being erected. It is probable from the evidence that the Contractor was subjected to some delay and inconvenience in erecting the leaves at Gatun and Pedro Miguel due to the great frequency with which they were plumbed up under the instructions of Mr. Goldmark. The evidence shows, however, that in one case it was necessary to take down part of a leaf that had been erected. Mr. Marshall or Mr. McClintic and Mr. Goldmark examined this leaf together, and the parts of it that had been erected were taken down, and from that time on the plumbing up was required to be made twice a week. (See p. 110 of the testimony of Mr. Goldmark, vol. 8.) This showed inefficient work on the part of the Contractor.



It is difficult to determine whether or not the inspectors of the Isthmian Canal Commission exceeded their authority by suggesting to the Contractor methods of erection that they thought would be suitable. It is clear, however, that in the particular of plumbing up the leaves at stated intervals and correcting them so as to properly adjust the alignment, this method was insisted upon under instructions from Mr. Goldmark at Gatun and Pedro Miguel after the leaf was taken down in the early part of 1912, as shown in the testimony of Mr. Goldmark, page 110, volume 8, and in his report, volume 1, quoted on page 435 of this report, second paragraph, under "(p. 104)." (See also letter of Mr. Goldmark to Mr. Jewel, dated Feb. 9, 1912, Exhibit 4 of Mr. Courter's testimony, p. 16, vol. 16.) Whether or not this action caused a very great increase in expense in the erection of the steel frames is a matter of estimate as to how far the Contractor was responsible for it must be estimated. The data furnished by the Contractor showing the distribution as to cost in the erection of the leaves which would be affected by this action of the Commission's inspectors is not accurate. (See vol. 26, blue print giving distribution of labor expenses incurred on the Isthmus.)

From this distribution, it appears that under the heading of "Steel frame erected" it cost, per ton, \$9.25 at Gatun, \$21 at Pedro Miguel, and \$5.45 at Miraflores. There is undoubtedly in this charge at Gatun and Pedro Miguel a part of the charge for bolting up. This is shown from the comparative statement of cost per ton which has been worked up from the total cost shown in the blue print of the contractor. (See vol. 26.)

The only way in which the excess cost in connection with this part of the claim can be taken care of, if there was any, is in fixing the final responsibility for the total excess cost between the Panama Canal and the Contractor in considering the claim for rush work. There is no claim made that there was any interference on the part of the inspectors at Miraflores under which the Contractor undertakes to establish a normal to be applied at Gatun and Pedro Miguel.

Further consideration of this claim will be made when considering the claim for rush work. For further details see testimony as follows:

Goldmark, volume 8, pages 108 to 111, 237 to 239.

Sterrett, volume 9, page 10.

Courter, volume 16, pages 11 to 24, 82 to 83, also Exhibits 4 and 5.

Hess, volume 17, pages 24 to 29 and 76.

Dumville, volume 32, pages 54, 89, and 111.

Howe, volume 32, page 71.

Wright, volume 32, pages 125 and 126.

Gynn, volume 32, pages 156 to 161.

Roberts, volume 35, pages 48 to 50.

Huxley, volume 37, Exhibit 3.

#### CLAIM FOR RUSH WORK.

The amount to be deducted from the actual expenses at Miraflores in arriving at a normal to be applied at the other lock sites is stated on page 75 of the Contractor's claim as follows:

(h) *Rush work, 17,752 tons, at \$8 per ton, \$142,000.*

On page 63 of the Contractor's claim he states the basis of this claim as follows:

Fifth. That taking into account the extension of time to which the Contractor was entitled, on account of the delays caused by the Commission, he was

required to and did complete the work in a much shorter time than that provided for in the contract.

That in order to meet these requirements of the Commission the Contractor had to resort to a large amount of rush work, which again caused enormously increased costs in the field.

That even if the delays previously described had not occurred, much of this expensive rush work would have been necessary on the leaves at Pedro Miguel and Miraflores, as the masonry for these leaves was very much behind the dates established in the contract, making the time available for the erection of these leaves too short for carrying on the field operations in an economical way when the kind of work that had to be done in the field is taken into consideration."

After stating his specific claim under "Fourth," page 49 of the claim, the Contractor states that—

On account of the above, the Contractor was seriously delayed and put to large extra expense.

By the above the Contractor means the specific claims that have been considered in detail in this report under money claim 6.

On pages 63, 64, and 65 of his claim the Contractor makes a short statement of the facts on which he relies in support of the above contention. This statement of the Contractor is quoted below:

It will be noted that serious delays occurred. A claim for extension of time was made by the Contractor under date of December 7, 1912, modified after further investigation at the Isthmus by letter to Mr. Goldmark under date of January 18, 1913. As a result of this claim, a supplemental agreement was entered into under date of May 20, 1913, between the Commission and the Contractor, establishing new contract dates under which the gates had to be finished so that water could be turned into the canal and the gates operated. The vital dates of this agreement are: October 1, 1913, being the date of completion for all guard gates and all other gates on one side of the canal, and March 1, 1914, being the date of completion for the balance of the work. It is still claimed by the Contractor that the dates established in his letter of January 18, 1913, were reasonable and fair. In accordance with this letter the last gates need not have been completed until April 8, 1914. It should be stated here, however, that in arriving at the dates given in this letter of January 18, 1913, the Contractor made no allowance and put in no claim for the time required to do the additional work not called for or contemplated under the contract. It has been shown that such work had to be done, causing great extra expense. This being established, it naturally follows that such extra work also takes time, and that work like bolting up with small holes, cleaning to a polish, etc., takes lots of time. Therefore, considerable time should be added to the dates established in the Contractor's letter of January 18, 1913, making the fair date for completion much later than April 8, 1914.

For reasons known to the Commission the Contractor was urged to use every effort and spare no expense to complete the work covered by this contract as soon as possible.

As a matter of fact, the dates of the supplemental agreement were actually anticipated by the Contractor, the work called for to be finished by October 1, 1913, and March 1, 1914, being finished by September 24, 1913, and January 26, 1914, respectively.

This, however, could only be accomplished by an immense amount of overtime and rush work at a very large expense to the Contractor, and for this expense the Contractor claims that he is fairly and justly entitled to proper compensation.

The masonry for the gates at Pedro Miguel and Miraflores was delayed beyond the dates established in the contract as follows:

Leaves 50 to 57, Pedro Miguel,  $3\frac{1}{2}$  months.

Leaves 58 to 61, Pedro Miguel, 4 months.

Leaves 62 to 73, Pedro Miguel, 8 months.

Leaves 100 to 107, Miraflores, 4 months.

Leaves 108 to 111, Miraflores, no information.

Leaves 112 to 115, Miraflores, 3 months.

Leaves 116 to 119, Miraflores, 6 months.



For leaves 120 to 127 at Miraflores, the masonry for which should have been completed by November 1, 1912, the masonry was not finished on January 20, 1913, but was expected to be finished soon thereafter.

The details of the way in which the Contractor arrives at the amount he thinks he should be allowed for rush work are stated on pages 82, 83, and 84 of his claim. These pages, for easy reference, are quoted below:

(h) *Rush work.*—The table on the following page shows the total costs and the costs per ton for the erection of the various leaves at Miraflores.

From this table it will be seen that leaves 124 to 127—all of which had to be erected in the shortest possible time—cost \$59.28 per ton. Leaves 120 to 123—two of which had to be erected in a great rush, otherwise the conditions being identical—cost \$51.24. Leaves 100 to 103—all of which had to be erected in a great rush, although not quite as much as 124 to 127—cost \$57.44. More or less rush work also had to be done on leaves 104 to 123, located on one side of the canal.

It will be seen from the above that rushing two leaves increases the cost for the total tonnage of four leaves by about \$8 per ton, or it is fair to state that if these Miraflores gates had not need to be rushed, either all the way across the two chambers or across one chamber only, the total cost of all these leaves would have been \$8 per ton below the average, or about \$43 per ton.

*Table showing erection costs at Miraflores.*

Contract No.	Leaf Nos.	Location.	No. and height of leaves.		Total.	Erection cost at Isthmus.	
			No.	Height.		Total.	Per ton.
				<i>Ft. In.</i>	<i>Tons.</i>		
4857	100-103	Upper guard gates.....	4	47 4	1,567	\$90,020	\$57.44
4859	104-107	Upper gates.....	4	77 0	2,752	133,076	48.35
4861	108-111	Middle gates, upper lock.....	4	77 0	2,738	131,240	47.93
4863	112-119	Safety gates and lower gates, upper lock.	8	77 0	5,462	270,579	49.53
4865	120-123	Lower gates, lower lock.....	4	82 0	2,954	151,319	51.248
4867	124-127	Lower guard gates.....	4	66 0	2,279	135,045	59.28
					17,752	911,259	51.35

To verify this the Contractor has made an analysis of the money spent for the regular day's work and the overtime at Miraflores, and finds as follows:

Pay for regular hours worked.....	\$603,515
Pay for overtime (exclusive of excess rate) (27.9 per cent).....	168,560
	<hr/> 772,075
Excess paid white labor for overtime (7.45 per cent).....	57,532
	<hr/> 829,607
Total.....	

From this will be seen that a claim of \$8 per ton for the rush work is entirely fair for the reasons:

First. In order to get the work done the largest possible number of men was crowded on these leaves, which, of course, meant lack of efficiency and increased the cost.

Second. These men had to work on an average 28 per cent overtime over the regular hours they were supposed to work. That means that every man all the time averaged 13½ hours overtime per week. This naturally means lack of efficiency and increased cost.

Third. At Miraflores the Contractor actually had to spend in excess rates paid for overtime to the white labor \$57,532, which amounts to \$3.25 per ton on the Miraflores tonnage, or to approximately 7½ per cent of the normal cost.

The Contractor therefore claims that on account of this rush work he had to incur an extra expense of \$8 per ton on approximately 17,750 tons, or \$142,000.

In his report, volume 1, pages 120 to 126, Mr. Goldmark gives his recollections as to this claim, which are quoted below:

*Claim 5 (p. 63).*—The gist of this claim is:

(a) That the Contractor was required to and did complete the work in a shorter time than required by the original contract, on account of the extension of time to which he was entitled on account of delays caused by the Commission;

(b) That the Contractor had to resort to a large amount of very expensive rush work in the field to meet the requirements of the Commission; and

(c) That even without allowing for these delays, much of the expensive rush work was made necessary by the failure of the Commission in not having the masonry completed by the date established in the original contract.

*Claim 5 (a).*—As to these delays, all to which the Contractor made claim prior to January, 1913, were stated in a letter to the general purchasing officer, dated December 7, 1912, and to myself of January 18, 1913 (file 84-C-81, Pt. XI). Some details as to these delays are contained in a file marked 84-C-81 delays. These are mainly letters submitted by the Contractor in January, 1913, when making his claim on the Isthmus. Attention is especially directed to a letter from Mr. Wolfel to his firm dated December 4, 1912, which they state is the basis of their letter of December 7, 1912, and contains the first statement of the delays claimed by them.

These delays were thoroughly gone into by myself when they were presented, and a full report rendered to Col. Hodges in letter of January 27, 1912, copy of which has been appended to this report. Col. Hodges's recommendation to the chairman was contained in a letter of February 25, 1913, and a further letter on the same subject from myself to Col. Hodges of February 21, 1913, is referred to, all in file 84-C-81, Part XI. The Contractor's claims were summarized in two blue prints marked "Exhibits A and B," the last revision of which was dated January 18, 1913, and took the place of an earlier print of the same shape contained in the files of the general purchasing officer. As a result of the investigation, and as a part of my report, the dates which were on the whole admitted fair—that is, which represented the claims which the Commission was prepared to admit—were summarized in two white prints of the same shape, which are in this office, having been filed with the contractor at the hearings on the Isthmus. These claims represent in some cases the views of the local engineers, rather than my own. I think in a few cases I was inclined to think that the delays allowed were smaller than they should have been, especially with reference to the allowance for water damage, due to flooding the locks and the failure of the Commission to furnish storage grounds and tracks at the proper time, and in proper condition. I should also say that delays granted in the case of the shipwreck of the steamship *Moldegard* were based in part on a statement from Mr. Hammer, which gives the exact details and is contained in a statement filed with the papers which have been sent here from the Pittsburgh office. As to the delays claimed up to January, 1913, I think the papers which I have mentioned above tell the whole story, in connection with a few other letters contained in Part XI of file 84-C-81, which may bear upon the subject. I think the dates, etc., mentioned by Mr. Wolfel are correct.

As to the delays occasioned subsequent to January, 1913, no claim for them had been made prior to the present "claims." I do not think that there was any subsequent delay at Pedro Miguel and Gatun which could have been complained of, except the general complaints as to severe inspection. At Miraflores there was considerable delay caused the contractors by the flooding of the locks in September, 1913, and at other times, and possibly also owing to trouble with getting sufficient storage grounds and tracks. The matter with regard to the flooding has been quite fully discussed under claim 3 (b). As to storage grounds at Miraflores, I have no information on this subject, and I do not believe any correspondence exists on this question later than January, 1913.

*Claim 5 (b).*—As to the claim that expensive rush work was made necessary by the delays, I understand that the Contractor means by this that it would have been necessary to resort to rush work even if the supplemental contract had not been made, though this is not clearly stated. It is quite true that allowing the Contractor all the delays he claimed in January, 1913, even without making any allowances for later delays, and comparing the dates which would be thus arrived at and which were stated on his blue-printed Exhibit B with



the actual dates of completion, he did actually finish the last leaves necessary for completing the locks from ocean to ocean earlier than it would have been obliged to. These final dates of completion were stated in a memorandum from myself to Col. Hodges dated February 12, 1914, file 84-C-81, Part XVI. In many cases the individual gates were completed after the contract dates arrived at for these individual leaves by adding the delays claimed to the original contract dates. In other words, under the original contract liquidated damages would have become due for certain gates, although the gates as a whole would have been completed prior to the last contract date as extended. I think, however, that the application of the original contract dates to all the separate leaves would in any event have been entirely unfair, whether any extension were allowed or not. The original contract dates were based in each lock on starting at the upper end and erecting the gates one after the other to the other end of the lock. This meant using only one set of erection bridges at each lock. As one set of bridges did not prove sufficient, the Contractor was permitted, and in fact urged to install additional bridges, which he did. It can readily be seen that this upset the whole program, advancing the completion of gates halfway down the lock. It would be most unfair to measure the actual date of completion in each individual case by the original dates set, which were based on other conditions.

That rush work was resorted to—meaning by this, Sunday work and overtime—is undoubtedly true in the case of Miraflores. I do not remember to what extent, if any, there was overtime work at the other two locks. I think there was some, but I do not believe that they claimed it in so many words. That a much higher speed was maintained after the autumn of November, 1912, there is no doubt whatsoever, and the Miraflores work was finished complete in not over 15 months. As to just how much this high-speed work was due to the delays, I am not prepared to say. A part of the rush was doubtless caused by the fact that previous to the change of management, in September, 1913, the work had lagged behind badly at several points. It is proposed to discuss this to some extent in the last part of this report. The matter is, of course, complicated by the fact that the supplemental contract was entered upon which established dates not based on the exact delays shown, but was simply supposed to represent the needs of the Commission as to completion. If, however, the Contractor includes in "delays" the alleged unreasonable requirements of the inspectors, etc., the question becomes still more complicated, as he nowhere states to what delays these requirements led. Furthermore, it may be pointed out that some of the delays would not come under the head of "character and finish not fairly within the meaning of the specifications."

*Claim 5 (c).*—As to the claim that expensive rush work would have been necessary at Pedro Miguel and Miraflores because the masonry was behind time, the dates established for the completion of the masonry were stated in the original contract and never changed. In January 1913, certain claims were made as to those delays. These are identical with the statement on page 65, except as to leaves 120 to 127 at Miraflores, as to the completion of which I can not testify, but I think the date stated is about correct. When making my report in January, 1913, I allowed the claims for masonry as stated by them. In other words, they were right as to the time of completion. According to the strict wording of the contract, they were entitled to an extension of time regardless of whether the delay in not having the masonry finished caused them delay or expense. As a matter of fact, the Commission has always claimed that they were not delayed—that is, they were not ready to start work until after the masonry was finished. My recollection is that this statement is correct. On the other hand, we could not judge whether they would have been ready exactly in all cases. Knowing, in certain cases at Pedro Miguel and Miraflores, that the masonry was not likely to be ready judging by conditions they saw, for several months, they naturally arranged their work elsewhere, both on the Isthmus and possibly in the shops, to meet changed conditions. The dates on which, according to our records, the masonry was ready, and also the date at which they actually began work is given (p. 126, this report) in a copy of a statement prepared for me about January, 1913 (file 84-C-81-XI). Of course, this shows merely the time they started to work, but does not show whether they could possibly have started work earlier if the masonry had been ready.

As to the damages they suffered from not having this masonry ready, this is still harder to state in exact terms. I never had any evidence that they did suffer damage from this, though there may have been a few days that they were delayed. I think at the lower end of Gatun, at the guard gates, they were

certainly put to extra expense, because the masonry, or perhaps rather the earth filling back of the masonry, did not permit them to use their ordinary method of erection, so that these gates had to be erected in a different manner, which cost more money and took more time, though I can not state the exact time or expense.

*Completion of masonry for lock gates in Pedro Miguel and Miraflores Locks.*

Leaves.	Contract dates for masonry.	Actual dates masonry finished.	Dates for masonry claimed by McClintic-Marshall.	Erection of gates actually begun.
Pedro Miguel.				
Upper guard gates.....	Mar. 11, 1911	June 17, 1911	June 17, 1911	Aug. 7, 1911
Upper gates.....	do.....	do.....	do.....	Jan. 29, 1911
Intermediate gates.....	do.....	Apr. 1, 1911	July 1, 1911	June 18, 1912
Safety gates.....	do.....	Nov. 1, 1911	Oct. 11, 1911	Dec. 15, 1911
Lower gates.....	do.....	do.....	do.....	May 1, 1912
Lower guard gates.....	do.....	Nov. 14, 1911	do.....	Apr. 9, 1912
Miraflores:				
Upper guard gates.....	Sept. 1, 1911	Jan. 2, 1912	Jan. 1, 1912	Sept. 10, 1912
Upper gates.....	do.....	do.....	do.....	Nov. 29, 1912
Intermediate gates.....	Jan. 1, 1912	Jan. 1, 1912	do.....	do.....
Safety gates.....	June 1, 1912	Sept. 3, 1912	Sept. 3, 1912	Oct. 23, 1912
Lower gate.....	do.....	do.....	do.....	do.....
Upper lock.....	June 1, 1912	Dec. 1, 1912	Dec. 3, 1912	Jan. 24, 1913
Lower gates.....	Nov. 1, 1912	do.....	do.....	do.....
Lower guard gates.....	do.....	do.....	do.....	do.....

NOTE.—The above statement refers only to Pedro Miguel and Miraflores Locks. There never was any question as to the dates of completion at Gatun.

On pages 201, 202, and 203 of his testimony, volume 8, Mr. Goldmark states:

Q. There is a claim made here that the Contractor had to resort to a very large amount of rush work in the field to meet the requirements mentioned. In a general way, do you know anything about that?—A. Well, they did do a great deal of rush work; there is no doubt about that, because they were the only people that worked Sundays and overtime. My inspectors had to work Sunday after Sunday to inspect the work that was done on Sunday; and the work went on until dark; and at Miraflores—I think that is where most of the rush work was, and also at the lower end of Gatun where six gates were—I have never seen work rushed harder anywhere than it was there for a long time. I mean Miraflores was very rapidly built; but toward the end, after definite limits had been laid down, it was a case of the kind of rush work that certainly cost more money than ordinary work, even when pushed. It was not the most economical way of doing it. The men were more or less in each other's way; and they were paying, I suppose, higher pay per hour for the overtime; and in that climate each man's efficiency was without any question cut down, not only for the overtime work, but for the whole work.

I should say that that fact, that they did resort to expensive rush work, is undoubtedly true. As to its being necessary to meet the requirements of the Commission, why I think that is true, too, because the chairman laid down certain dates which he wanted met, and I did not think, and I told him I doubted whether they could be met. He said they would have to be met, and they were met; and as to how that all came in with the contract dates and delays I do not know. But, in a general way, it was to meet the requirements of the Commission.

The testimony referred to and commented on by the Contractor in support of this claim is found in his brief, pages 141 to 157.

The extent to which the supplemental agreement entered into between the Contractor and the Isthmian Canal Commission, dated May 20, 1913, should affect this claim will be considered at this point. This supplemental contract is quoted in full in this report, beginning at page 271. It contains this provision:

It is further understood and agreed that the above provisions fixing new dates for completion of the various gates and providing a new basis for de-



termining the amount of liquidated damages due in case of delay in completion of the gates after such dates shall constitute a full and final settlement of all and any claims on account of delays and of all and any such claims for damages which have heretofore arisen or which may arise out of any delays which have occurred prior to the date of this contract, either on the part of the Contractor or on the part of the Commission, and that the determination of the causes of any delays in completion of any part of the work covered by this contract which may occur after the date hereof, and whether the Contractor is entitled to additional time within which to complete any part of the work, shall be made in the manner and under the conditions provided in the original contract of June 21, 1910.

It will be noted from this agreement that from the provisions quoted it was intended as a full and final settlement of all and any claims on account of delays and of all and any such claims for damages which have heretofore arisen or which may arise out of any delays which have occurred prior to the date of this contract, either on the part of the Contractor or on the part of the Commission.

It will also be noted that it provides that delays subsequent to the making of the contract shall be allowed as provided for in the original contract, dated June 21, 1910.

Under the terms of the original contract the only damages which the Government could recover by reason of delays on the part of the Contractor were the liquidated damages provided for in the contract. It is entirely problematical as to how far the Government might have been damaged by reason of delays and dilatory methods on the part of the Contractor, if this supplemental agreement had not been entered into. It was entered into with the full knowledge and a complete understanding that it would be necessary to resort to very strenuous efforts to complete the contract within the time provided for. In making this supplemental contract the Government was not in a position to urge any damages which it might have felt that it sustained by reason of the dilatory methods of the Contractor in the beginning of the work, except such as were liquidated in the original contract.

It would neither be fair, just, nor equitable to go back of this supplemental contract and take into consideration the delays that had occurred subsequently to the making of the contract and make them the basis of an allowance to compensate the Contractor for complying with the provisions of this supplemental contract.

The effort of the Contractor to make the delays cumulative and to recover for extra work that he was required to do to meet the stipulations contained in the supplemental contract do not seem to be justified, and the allowance to be made under this claim for rush work will be confined as nearly as can be done to such delays as resulted from causes not covered by the adjudication made in the supplemental contract.

Under this view of the case the only delays for which compensation should be allowed as such, under the act of June 24, 1914, are delays that occurred subsequent to the making of this supplemental contract, or delays which did result from doing the work "under requirements as to character and finish not fairly within the meaning of the specifications" which were not covered by that or some other supplemental agreement, or which occurred subsequently to the making of this supplemental agreement.

The extent to which the Contractor should be held responsible for the performance of his contracts and the extent to which the Govern-

ment should be held responsible for results has been pretty thoroughly analyzed in attempting to establish proper cost at Miraflores independently of the rush work. It is believed the division of responsibility for the various specific claims is an equitable one, and that the same percentage should obtain as to rush work. At the other lock sites there was not so much rush work, but the interference by the Commission was greater, and the methods of the Contractor were also much more dilatory.

In an exhaustive report by Mr. Goldmark to Col. Hodges, dated June 17, 1912, contained in "Letters copied from files," beginning with page 85, he shows the condition of the work at that date and gives his reason why no better progress had been made. This report is quoted below:

Herewith certain data regarding the lock gates, which may be of use in discussing the progress of erection with Mr. Marshall.

The attached tabulation shows by percentages the condition of the erection on June 1, 1912. It makes the backward condition of the work as a whole very apparent.

(1) As to erection: The status is fairly satisfactory. The following program as to gates not yet erected should be met without great difficulty, if there is no shortage of material:

	Erection begun.	Finish erection.
Gatun:		
Bridge No. 1—		
Safety gates.....	Apr. 1, 1912	July 1, 1912
Lower gates, lower lock.....	July 5, 1912	Sept. 6, 1912
Middle gates, middle lock.....	Sept. 20, 1912	Nov. 22, 1912
Lower gates, middle lock.....	Nov. 25, 1912	Feb. 1, 1913
Bridge No. 4—		
Middle gates, lower lock.....	Apr. 12, 1912	Aug. 1, 1912
Lower gates, lower lock.....	Aug. 4, 1912	Oct. 7, 1912
Lower guard gates.....	Oct. 10, 1912	Dec. 15, 1912
Pedro Miguel Locks:		
Bridge No. 2, middle gates.....	June 20, 1912	Aug. 22, 1912
Bridge No. 3, lower gates.....	May 1, 1912	Aug. 3, 1912
Yard crane, lower guard gates.....	June 1, 1912	Aug. 1, 1912
Miraflores Locks, upper lock:		
Bridge No. 3—		
Upper guard gates.....	Aug. 15, 1912	Oct. 11, 1912
Upper gates.....	Oct. 15, 1912	Dec. 17, 1912
Middle gates.....	Dec. 20, 1912	Feb. 22, 1913
Bridge No. 2—		
Safety gates.....	Sept. 10, 1912	Nov. 12, 1912
Lower gates, upper lock.....	Nov. 15, 1912	Jan. 17, 1913
Bridge No. 4—		
Lower gates, lower lock.....	Jan. 10, 1913	Mar. 14, 1913
Lower guard gates.....	Mar. 18, 1913	May 20, 1913

(2) As to reaming: The outlook is less promising.

Gatun:	
Total reamed holes in all leaves.....	2, 400, 000
Reamed to June 1, 1912.....	675, 000
Balance to be reamed June 1, 1912.....	1, 725, 000
Monthly rate—	
March, 1912.....	54, 351
April, 1912.....	112, 399
May, 1912.....	156, 391

The rate for May was 6,000 holes per working day. At this rate it would take 11 months to complete the reaming at Gatun, i. e., till May 1, 1913. To complete one side of the locks at Gatun for operation would require only 1,000,000 holes to be reamed after June 1, 1912. At 6,000 holes per day this



could be accomplished by November 15, 1912, if there were enough steel erected. This would probably not be the case, but the reaming should follow quite close after the finishing of the erection.

Pedro Miguel:

Total reamed holes, all leaves-----	1,400,000
Reamed to June 1, 1912-----	380,000
Balance to be reamed, June 1, 1912-----	1,020,000

If the rate at Pedro Miguel can be raised to 6,000 per working day, all holes would be completed by about November 20, 1912, which would be satisfactory.

Miraflores: Total reamed holes, all leaves----- 1,760,000

Reaming may begin at Miraflores by October 1, 1912. At 6,000 holes per day it would require 11 months, or until September 1, 1913, to complete the reaming on both sides of the lock. The 1,100,000 holes which would be required for completing one side only could be reamed by May 1, 1913, but it would probably take till June 1, owing to lack of erected steel. By concentrating all reamers at Miraflores both chambers could be completed by that date.

The reaming at both divisions has been held back by a shortage in erected steel and by an inexcusable lack of fitting up bolts. With a reasonable addition to the number of small reamers there should be no trouble in increasing the daily output of reamed holes to 8,000 or 9,000, which would relieve the situation fully.

(3) As to riveting. The situation is as follows:

Gatun:

Total field rivets-----	2,520,000
Driven to June 1, 1912-----	452,000
Balance -----	2,068,000

Monthly rate—

March -----	50,071
April -----	66,049
May -----	78,645

The last-named figure corresponds to 3,000 rivets per working day. At this rate it would take 2 years and 3 months to complete both chambers at Gatun, or until September 1, 1914. For one side only (requiring 1,165,000 rivets), at 3,000 per day, it would take 15 months, or until September 1, 1913. By increasing the output 50 per cent, to 4,500 rivets per day, both chambers would be completed in 17 months, or by November 1, 1913, and one chamber by April 1, 1913.

Pedro Miguel:

Total field rivets-----	1,482,000
Driven to June 1, 1912-----	346,000
Balance -----	1,136,000

Monthly rate—

March -----	57,368
April -----	69,354
May -----	50,800

At 3,000 rivets per day, both chambers would take 15 months, or till September 1, 1913, and one chamber (requiring 700,000 rivets) would take 9 months, or till March 1, 1913, to complete; at 4,500 rivets per day, the corresponding dates of completion would be April 1, 1913, and December 1, 1912.

Miraflores: Total field rivets----- 1,756,000

If riveting begins October 1, 1912, it would take, at 3,000 rivets per day, till August 15, 1914, to complete both chambers and till November 1, 1913, to complete one chamber (1,000,000 field rivets). At 4,500 rivets per day, the corresponding times would be September 1, 1913, and March 1, 1913, respectively.

It is clear that a large increase in the rivet output is imperative. At present there are not over 50 "guns" at work; the average daily number of rivets driven was 5,300 in May, or about 100 per gun. A fair average would be 300

In shipyards, 500 to 600 is common practice. The low figure is undoubtedly mainly due to the totally untrained labor largely employed on this work. The compressor plants will hardly supply over 70 guns. It is evidently necessary (1) to get additional compressed air for more guns; or (2) to work night and day; or (3) to use a better class of labor with increased output per gun.

A combination of all three alternatives will probably be necessary.

(4) As to "finishing." This includes the grinding of the end plates along the quoin and miter posts; the attachment of the end reaction castings and wedges and their adjustment, drilling, bolting, and riveting; the placing of the leaves on the pintles, and their attachment to the anchorages; the calking and testing for water-tightness and adjustment and babbitting of the end bearing plates; the adjustment of the sills; the painting and cementing and the placing of the footwalk railings, etc. So far this part of the work has proved extremely slow. The "finishing" of the first 4 leaves began at Gatun before February 1 and will hardly be completed by August 1, six months in all. Much of this work should be done by competent machinists, and at best requires considerable time. It is clear to me that the only way in which it can be completed in time is to begin the preparation of the ends, grinding, fitting, bolting of castings at an early stage of the erection, concomitantly with the reaming and riveting of the sheathing. In this way, when the riveting is completed, the end castings would also be fully adjusted and bolted. A considerable force of machinists, etc., would be required to do this, but the total cost would be no greater than with the lack of system.

I am satisfied that in the conduct of the entire work a radical change is necessary to avoid great disappointment in the completion of the gates. Some of the weak points in the present régime are the following:

(1) An almost total lack of esprit de corps among the men. There are constant friction and constant changes among the white Americans, many leaving, others ready to leave.

(2) Too few expert riveters familiar with plate or ship work. Too many unskilled negroes employed as riveters and being slowly trained at our expense.

(3) Lack of any foremen familiar with water-tight work.

(4) A lack of a sufficient number of machinists properly organized.

(5) Lack of foresight as to furnishing a sufficient number of tools, such as grinding wheels, and even ordinary fitting up bolts. The work has stood still many times from this last cause, even to the present time.

(6) Lack of planning so that the various parts of the work may progress together.

There is apparently no reason why the "erection" should not proceed rapidly from now on, and there are no difficulties as to fitting of the plates, casting, etc. It is entirely a matter of providing labor, materials, and tools in sufficient quantity and utilizing them properly. There should be no unsurmountable difficulty in accomplishing this.

This memorandum was prepared at the time of the contemplated change in the management by the Contractor, also at a time when the question of making the proper progress in the erection of the lock gates was acute. It was prepared by Mr. Goldmark, who had been in charge of the work up to that time and who expected to continue in charge of the work and to be responsible for results. It is believed, therefore, that it, in a general way at least, represents the actual conditions as they existed at the time it was prepared. In his report prepared on this claim, volume 1, under the heading of "General remarks," he discussed quite fully the conditions as they existed before and after the change in the management. The part of his report covering this subject is contained in pages 139 to 149, inclusive, quoted below:

#### GENERAL REMARKS ON THE ERECTION.

The preceding portion of this report has been devoted to discussing in detail the various claims made by the Contractor. Most of these refer to charges that the requirements of the Commission, as to inspection, etc., had been more severe than warranted by the specifications or by first-class practice on other work. Some of the claims, however, include other ways in which the Com-



mission, it is charged, was at fault, or at least delayed the Contractor unnecessarily and put him to greater expense. There were also some delays not mentioned by the Contractor which did delay the work, but which it is not claimed were due to any action of the Commission—such as the loss of a considerable quantity of material on the steamship *Moldegard*, lost by shipwreck. The claims are misleading, as the total rush work required to make up for the delays is implicitly charged up against delays caused by the Commission, while there is no doubt that delays owing to acts of God, etc., did also delay the completion of the work. For such delays the Contractor was entitled, under the contract, to an extension of time, but not to extra compensation. The claim of the Contractor is distinctly a claim that all expenses incurred by him, over and above what he estimated upon, were caused by improper acts of the Commission.

This report would not be complete if it did not cover the question whether any increased expense and delay was not occasioned by actions of the Contractor, such as failure to prosecute the work in a proper way, to supply proper erection plant, tools, materials, erection force, etc.

The delay and expense may have been due in part to bad management in the shipment of material from the shops, so that certain gates were held up in the field.

The erection plan and methods adopted by the Contractor and approved at the beginning were on the whole excellent. They were changed to a very slight extent during the progress of the work. It must also be stated, as strongly as possible, that the work, when completed, was extremely good—more than fulfilling the expectations of the engineers. Furthermore, after the difficulties encountered with the first eight leaves, the shopwork was also far above the average, the fitting of all parts was almost perfect, and I have never known less errors to be met with in the fitting of the several parts. Further, the spirit in which the Contractors did the work from beginning to end was extremely good. They met the requirements of the inspectors with very little complaint at any time. As noted above, the methods used in the erection, as far as general plan, machinery, etc., are concerned, were beyond criticism, but during the period ending about September 1, 1912, if the erection is considered in detail, it must be said that in many ways it was not efficient. The number of men for whom accommodations were to be furnished by the Commission was specified in the original bid, and in a cable from the general purchasing officer to Col. Hodges, June 17, 1910, file 84-C-81, Part II, he quotes the Contractor as saying:

“Quarters will be required for 125 skilled whites and 150 colored laborers on each division.”

This, of course, was a decided underestimate. I think it can also be fairly said that the foremen put in charge at the beginning were not men of sufficient capacity to handle this enormous contract, exceeding perhaps all others ever let. Both the foremen first employed at Gatun were men of rather small experience, at least as far as I know, and I do not think their command over their men was what it should have been. At Pedro Miguel, I think, the work was hampered to some extent by the disagreements between the local superintendent and the general manager at Gatun. At any rate, when the management was changed in September, 1912, the class of men put in charge was very much superior.

There is no doubt that the work of erection was hampered for a long time by the failure to receive material from the States. In some cases large amounts of steel were received, but for some reason or other some important parts were not sent, which were necessary in order to begin and to prosecute the work properly. As early as August 18, 1911, only a few months after the beginning of the work, Mr. Jewel writes that he is ordering one additional set of erection bridges in order to complete the work more rapidly though it is true that he claims that the additional equipment is needed owing to serious delay in getting the work started. On August 28, 1911, the chairman, writing to Maj. Boggs, says that the progress made up to that time indicates very clearly that the contractors will be unable to live up to the dates stated in the contract for the completion of the gates by sets. Maj. Boggs is urged to take the matter up with the Contractors.

November 25, 1911, Mr. Marshall to the chairman writes agreeing to order a third set of erection bridges if necessary, and promises that the work will soon be in better shape.

December 8, 1911, Mr. H. Goldmark to Mr. Rousseau states that half the material has been shipped from the shops, but that only 7 per cent has been



erected and 3 per cent of the total number of all rivets driven. The need of a larger force is urged.

In letter of same date, Mr. Rousseau makes some recommendations to the chairman.

February 21, 1912, Col. Hodges writes to Mr. Jewel referring to the delay in completing the upper guard gates at Gatun, which were to have been finished November 1, 1911. Col. Hodges says:

"Great leniency has been shown you in regard to the delay in completing the gates."

He also says:

"It is quite clear to me that this work is not being pushed with sufficient energy. Apparently you do not realize the seriousness of your position, and I am writing you this letter to urge once more the necessity of greater energy in prosecuting this work, increasing your force of skilled laborers, etc."

April 20, 1912, chairman to Mr. Jewel, again calls his attention to the need of completing the upper guard gates at Gatun. He states that the first leaf was not swung until April 16, while a large amount of work remains to be done.

June 4, 1912, Mr. Marshall, to the chairman, says that he begs to advise:

"That we will arrange to conduct our work on the Isthmus in a manner which we trust will be satisfactory to you. We have made so many predictions as to what we were going to do that we realize that you are now more interested in results than you are in promises. We are disappointed that we have not made a better showing up to date, and, of course, we can find excuses for all of the delays; but we will not trouble you with reciting them at this time. We still have hopes that the work will be finished up finally within the contract time. In the meantime we are using every effort in our power to advance the work as rapidly as possible. We hope that there will be no further contingencies arise over which we have no control, which would further delay the work. I expect to arrive on the Isthmus about the 20th and will be prepared to go over the matter in detail with you."

On June 17, 1912, I wrote a memorandum to Col. Hodges, giving certain data "which may be of use in discussing the progress of erection with Mr. Marshall," and giving the exact status of the work. The erection proper—that is, the raising of the steel—was fairly satisfactory. As to the reaming, the outlook was less promising. Three-fourths of the rivets remained to be reamed at Gatun, and about the same at Pedro Miguel. No reaming had been done at Miraflores. I said:

"The reaming has been held back by a shortage in erected steel and by an inexcusable lack of fitting up bolts."

As to the riveting, 452,000 rivets had been driven at Gatun out of 2,520,000. At this rate it would take 2 years and 3 months to complete the riveting at Gatun. At Pedro Miguel, 346,000 had been driven out of 1,482,000, so that it would take, at that rate, 15 months longer to complete the work. At Miraflores no rivets had been driven. I said:

"It is clear that a large increase in the rivet output is imperative. At present there are not over 50 pneumatic riveters at work. The average daily number of rivets driven is 5,300 in the month of May, or about 100 per machine. A fair average would be 300 in shipyards, though 500 to 600 is the common practice. The low figure is undoubtedly mainly due to the totally untrained labor largely employed on this work. The compressor plants will hardly supply over 70 guns. It is evidently necessary (1) to get additional compressed air for more guns, or (2) to work night and day, or (3) to use a better class of labor with increased output per gun. A combination of all three alternatives will probably be necessary."

The finishing is stated as being extremely slow. It is further stated:

"I am satisfied that in the conduct of the entire work a radical change is necessary to avoid great disappointment in the completion of the gates. Some of the weak points in the present régime are the following:

"(1) An almost total lack of esprit de corps among the men. There is constant friction and constant changes among the white Americans, many leaving and others ready to leave.

"(2) Few expert riveters familiar with bolted or ship work. Too many unskilled negroes employed as riveters and being slowly trained at our expense.

"(3) A lack of any foremen familiar with water-tight work.

"(4) A lack of a sufficient number of machinists properly organized.

"(5) A lack of foresight as to furnishing a sufficient number of tools, such as grinding wheels and even ordinary fitting-up bolts. The work has stood still many times from this last cause, even to the present time.



"(6) A lack of plan so that the various parts of the work may progress together.

"There is apparently no reason why the 'erection' should not proceed rapidly from now on, and there are no difficulties as to the fitting of the plates, castings, etc. It is entirely a matter of providing labor, materials, and tools in sufficient quantity and utilizing them properly. There should be no unsurmountable difficulty in accomplishing this."

I think this letter covers the subject quite fully. I am inclined to think that my complaint as to the class of riveters, while correct enough at the time, would be misleading unless I stated my present opinion, namely: That the use of colored riveters was the proper thing. Ultimately they were trained without special trouble and did by far the greater part of the work in an entirely creditable manner.

On June 25, 1912, Col. Hodges asks the Contractor to inform him in detail of the steps proposed to be taken to hasten the completion.

Mr. Marshall came to the Isthmus at that time and went over the work in some detail. He was at that time not satisfied with the progress and promised improvement.

July 16 a further letter is written by the chairman to Mr. McKinley, acting manager of erection, urging the completion of the upper guard gates at Pedro Miguel. He says:

"My patience is entirely exhausted with the lack of energy and activity which is displayed in the conduct of the work in general; in the finishing of half-done work in especial."

On the same date the chairman wrote a letter to McClintic-Marshall, at Pittsburgh, inclosing the last letter, in which he says:

"I had hoped that the recent visit of your president to the Isthmus would have resulted in energetic, active progress on the lock gates, but I regret to say that there is no evidence that such a result has been accomplished. Your employees here either can not or will not push the work on your contract as it should be done. I make no attempt to place the blame, but state a fact which is patent to any observer. As you are well aware, the portion of your work which is causing the principal delay is the riveting. Last week some 50,000 rivets were driven, and you had, say, 51 machine gangs and 4 hand gangs at work. I need not say that the stated number of rivets is no adequate output to the number of gangs. There must be inefficiency somewhere, and it seems to me that it is your duty to find it and remedy it. You should either get better work from your gangs or increase the number. You now need nearly 100,000 rivets per week to keep up to your schedule. Please let me know at once what steps you intend to take to improve matters."

The reply to this was a letter from Marshall to the chairman, dated August 6, 1912, in which he announces the change of management. He further writes to Col. Hodges, on August 9:

"As you know from our conversation during my last visit to the Isthmus, we were not satisfied with the way our work was being handled."

He states that he is sending Mr. W. M. Sterrett to act as manager and Mr. J. O. Childers to act as superintendent of erection under Mr. Sterrett.

"These are the very best men in our employ, and we hope that they will secure the desired results."

These letters are given in order to show the long-continued complaint made by the Commission and to indicate somewhat in detail just what was complained of. Subsequent to the change of management there are absolutely no complaints on file. The equipment was largely increased. Spare parts which had been missing to a considerable extent were supplied for all machinery. A better spirit prevailed among the men, and within a few months the output was enormously increased. Absolutely no criticisms can be made of the way in which the work was carried on after September, 1912. The number of rivets rose to a maximum of 660,000 in one month, as compared with one-third as much previously. The increase in the number of men is shown on a blue-printed table submitted herewith, which was compiled from the inspector's reports, and is rather an underestimate of the total number of men. At Gatun the number was about doubled, and also at Pedro Miguel. Miraflores had hardly been begun prior to the change in management. The total number of men shown on the table is about 4,700, but it was probably nearer 5,300 for one month, at least. The gradual decrease in the force as the work was being completed is also clearly shown.

There is no doubt whatsoever that the work in the earlier months of the erection was hampered badly by lack of material, and it is also true that it was absolutely necessary to experiment to a certain extent so as to arrive at the best method of erection. In many respects the work of erection merited high praise from the very beginning. The leaves were, with very few exceptions, extremely straight and true, and the work generally of a very high degree of excellence. I think, however, that an unprejudiced view of the erection during the first year would lead to the conviction that the plant and tools and men were not sufficient, and that they were not handled in such a way as to give the very best results. This is a matter, of course, difficult to show by figures, and I hesitate to express any opinion too decidedly, as the difficulties to be met with in this huge work were very great indeed. (I am quite sure that any statement that actions of the Commission or the inspectors hampered the work are an absolute distortion of the facts.) The foremen at the different locks and the different gates were frequently changed and the inspectors were often the only men who had detailed knowledge of just what the experience had been in the different parts of the work. Inspectors were, therefore, necessarily called upon to point out the difficulties to be met with, and as the work proceeded, to make sure that nothing was done which was irremediable; that is, no mistakes made in the erection which could not be corrected afterwards. Many of the gates stood for a long time in an incompleated condition, more especially, I think, at the Pedro Miguel Lock. Many small corrections were made from time to time; the foremen were changed; it was only the inspectors who kept a record of just what had been done.

Before the gates were painted or cleaned for painting, in fact before the water test was made, it was necessary to make a very careful search through the gates to find rivets that were omitted, pieces of material wrongly placed, etc. The replacing of these rivets—one here and one there—was of course a very expensive piece of work, and one that caused more or less complaint and friction. It was absolutely necessary, however, to do this.

I must repeat that there was absolutely no hitch in what we may call the major part of the work. The tests for water-tightness were made in all cases without the slightest difficulty. The attachment of the gates to the anchorages was easily made, and the gates were rolled into place readily. The deflections under their own weights were very small; everything indicated that the work was of a very high grade. There were certain points as to the inspection, the grinding of the ends and the acceptance of rivets, the bolting up, etc., on which the inspectors and the Contractor's men at times differed. But considering the large amount of work to be done, the distance from the United States, the difficulty of insuring that every piece of steel should be on hand at exactly the right time for completing each individual gate, etc., I think the troubles were rather less in proportion than I have met with in large bridges in the United States. The final results obtained, the erection methods, and the erection itself as a whole, were distinctly creditable to the Contractors, and the gates as they stood completed were, as far as I know, entirely beyond criticism.

The above statement has been prepared by me after carefully going over the files of correspondence brought to this office from the Isthmus, and also the letters and reports from the assistant engineer's office at Pittsburgh, which refer to the approval of plans, and the shop and mill inspection. The statement is based on my recollection regarding the various points raised, and the information contained in the correspondence, and represents, to the best of my knowledge, the opinion I held regarding the different points at the time. The matters treated of, except where modified in the statement, also represent what I now consider to be a true account of the points at issue.

I hereby certify that the statements contained in the above report, where based upon personal recollection are true to the best of my knowledge and belief; and that where based upon correspondence, they represent a fair statement as to what the correspondence shows.

That the statements contained in the report of Mr. Goldmark quoted above and in his memorandum of June 17, 1912, pretty accurately state the conditions as they existed at that time is shown by the testimony of Mr. H. H. McClintic taken at Rankin July 1, 1915, volume 19, pages 59 to 91, inclusive. Mr. McClintic, in his testimony, substantially agrees with most of the statements made by Mr. Goldmark, but he attributes a considerable part of the delay



and slow progress to the inspection, either in the United States or on the Isthmus. The exhibits introduced in connection with his testimony, from 1 to 8, inclusive, deal largely with the progress of erection made up to that time. On page 67, Mr. McClintic states that Mr. Jewel had trouble in getting his men, and the main reason for this was that business had picked up in the United States and men preferred employment there to employment on the Isthmus. He further stated that there was some difficulty in securing the necessary married quarters. Mr. McClintic made a trip to the Isthmus in January, 1912. He was asked the object of that trip and stated (see pp. 73 to 75 of his testimony, vol. 19) :

A. My next trip to the Isthmus was early in 1912, Mr. Marshall and I went to the Isthmus at that time to investigate conditions and see what could be done to expedite the work. I requested Mr. Marshall to go down with me for the reason that I was convinced that a change should be made in the management and organization on the Isthmus if the work was to be completed on time to meet the Government's requirements.

After investigating conditions, Mr. Marshall believed that the best interests of the company and the Government would be served by not making a change at that time. In July, 1912, he became convinced that a change was necessary and it was promptly made, Mr. Sterrett being put in charge of the work on the Isthmus.

(Above answer substituted by permission, July 2, 1915.)

Q. What condition did you find the work in when you get down there?—A. Well, the progress of the work was slow.

Q. What do you think was the cause or the causes of the slow progress that was being made?—A. Personally, I was not satisfied with the way Mr. Jewel was handling the work.

Q. Well, that would be one reason; now, what others?—A. That was the reason.

Q. What condition did you find the storage yards in?—A. Well, without going into the details, what we were looking for was results; Mr. Jewel was not getting the results.

Q. Well, did you investigate sufficiently at the time to satisfy yourself as to the particular reasons or causes why Mr. Jewel was not getting the results?—A. Yes; Mr. Marshall and I went over the work thoroughly with Mr. Jewel, and I felt satisfied that he would not get results, due to the manner in which he was handling the work.

Q. Well, was that due to his inability to properly organize his force and to control it?—A. That was due to all of the causes.

Q. All of what causes?—A. The causes—the conditions on the Isthmus and his own ability, and all, at that time.

Q. Then, as a matter of fact, you did not consider at that time that the organization was in the proper condition to produce the necessary results?—A. Not at that time. This was not, however, entirely Mr. Jewel's fault. He had been held up for lack of material, due to delays at the shop, so that his force became disorganized, and he was unable to get proper results. This delay was caused largely through the fault of the Commission in failing to furnish the necessary information to proceed with the work and a lack of decision in inspecting and accepting work and in lack of inspecting and accepting materials and finished work.

The exhibits referred to, explaining the causes of delays, do not attribute any great part of such delays to a lack of material, except in the beginning of the work. In a letter dated November 25, 1911, Exhibit 4 of Mr. McClintic's testimony, volume 19, Mr. Marshall stated:

A great deal of the delay up to the present time has been on account of lack of proper material at the Isthmus. We experienced a great deal of trouble in getting this work started in the shop, and early in the work the progress was indeed discouraging, but things have straightened themselves out so that there

is no question but what we could make complete shipment of all the material long before it is required. We are in hopes that the erection will line up in an equally satisfactory manner in the very near future.

In explaining the delay, May 7, 1912, Exhibit 6 in Mr. McClintic's testimony, Mr. Marshall states that they were being held up on account of material which was lost on the steamship *Moldegaard*. He also states that material was being held up on account of a strike of stevedores at Baltimore, and that he had arranged to reship some 4,000 tons from Baltimore to New York. On September 18, 1912, in a letter from Mr. Hammer to the McClintic-Marshall Construction Co., he complained of the small tonnage during the month of August. In a letter of September 26, 1912, Exhibit No. 8 of Mr. McClintic's testimony, volume 19, written by Mr. McClintic, he stated:

As you know, we have been terribly handicapped on account of breakdowns in our power house for the last two months, which largely accounts for this small tonnage.

These facts, which have been discussed in detail in this report heretofore, indicate pretty clearly that the progress of erection prior to July, 1912, had been interfered with by a great many causes for which the Government was not responsible.

The first steel was erected May 27, 1911. In a report made by Mr. Jewel December 1, 1911, copied from Isthmian files, part 2, No. 17, copy of which is found in "Letters copied from United States files," page 195, he shows that the total tonnage erected to that date was 3,475; holes reamed, 194,291; and riveted, 176,788. In a report dated December 8, 1911, Mr. Dumville states the approximate number of employees on the lock gates at Gatun as 46 white men and 193 black men, making a total of 239. (See p. 205, "Copies of letters from United States files.") This list of employees is shown below:

Superintendent of erection	1
General foreman erection	1
Foreman steel yard	1
Foreman erection (east chamber)	1
Foreman erection (west chamber)	1
Leading men riveters	2
Leading men on erection	5
Leading man machinist	1
Leading man electrician	1
Leading man water-tight work	1
Tool-room keepers	2
Machinists	4
Electricians	2
Blacksmiths and tool dressers (black men)	3
Chippers and calkers	4
Bridgemen on erection	7
Cranemen	2
Signalmen	2
Carpenters	2
Gauge machine riveters, four men to gang	9
Gangs hand riveters, five men to gang	2
Blacks, as helpers, bolters, reamers, and laborers	150

In a report of Mr. Jewel, dated December 31, 1911, giving the distribution of the work at that time (see p. 117, "Letters copies from U. S. files") it appears that 2 per cent of the tonnage was erected in December, 1911; that the total erected to December 31, 1911, was 8.5 per cent of the whole; that the percentage of holes reamed to that date was 5.5 per cent, and the percentage of rivets driven to that date was 4.4 per cent of the whole. On May 2, 1912,



Mr. Jewel addressed the following letter to the chairman and chief engineer (see p. 93, "Letters copies from U. S. files"):

I hand you herewith report on the lock-gate work completed during the month of April.

The amount of material erected during the past month is at least 2,000 tons lower than it would have been except for a shortage in material, which affected all erection crews except the first crew working on the upper level at Gatun.

Practically all of the material which was lost on the *Moldegaard* and re-manufactured under other contract numbers was delayed in delivery here, on account of bad weather at the Rankin plant prohibiting the painting, inspection, and acceptance of this material there. The same cause applied to other material to a greater or less extent. There has also been considerable delay in loading vessels at Baltimore on account of the longshoremen's strike there.

The *Nordpol*, now discharging, however, and the *Belaseo* en route from Baltimore, are expected to supply all deficiency in material at Pedro Miguel and also furnish enough material for the lower level at Gatun, so that all the erection bridges can be worked to their capacity after the delivery of these two cargoes.

In an inclosure accompanying this letter, quoted on page 94, "Copies of letters from U. S. files," is a statement showing the distribution and totals of work accomplished at that time. From this report 2,646 tons of steel was erected in April, 1912, or 4.56 per cent of the whole, and 13,862 tons was the total that had been erected to that date, or 23.90 per cent of the whole. Reports of reaming and drilling show that 2.96 per cent of the reaming was done in April, and 15.25 per cent of the total had been done at that time. Of the riveting, 2.36 per cent was done for the month of April, and 11.63 per cent of the total was done. At this time Mr. Jewel had been engaged on the work for considerably more than one year. He had been erecting steel for a little more than 11 months. The progress that he had made was clearly not such as to justify the conclusion that he would be able to complete the work within anything like the time provided for in the contract after allowing additional time for all the delays he might be entitled to under the terms of the contract.

During the time Mr. Jewel was in charge of the work he expended \$668,107 for the McClintic-Marshall Construction Co. on the lock gates and other small contracts with the Commission. The extent to which he made expenditures on other contracts is not specifically shown in the statement of the McClintic-Marshall Construction Co. showing the cash transactions with Mr. Jewel as taken from their ledger. The greater proportion of it was spent in the work of constructing the lock gates.

The amount of cash that was expended by Mr. Sterrett subsequent to August 21, 1912, in the completion of the lock gates and other work was \$2,852,606.19.

The expenditures by Mr. Jewel and Mr. Sterrett combined on work other than the lock gates was \$88,082.92. (See vol. 27 of evidence, Routine Data.)

Stated generally the expenditures of Mr. Sterrett were more than four times as great as the expenditure of Mr. Jewel. The period of service of the two managers was relatively the same.

Mr. Jewel had prepared an estimate of erection upon which the bid of the Contractor was based. His estimate of the total cost of item No. 1 was \$15.04 per ton, with 17 per cent of labor charges added for office expenses and 16½ per cent of labor charges added for rigging, supplies, and transportation. (See vol. 11, Exhibit No. 1.) In Mr. Goldmark's report there is a blue print showing the force employed by

the Contractor on the lock-gate material compiled from inspectors' reports under the old and under the new management. From the evidence quoted from and referred to above it is clear that under Mr. Jewel's management the necessary erection force and necessary employees had not been obtained and properly organized to prosecute the work, independently of any action of the inspectors, so as to complete the work within the time provided for under the terms of the original contract, after making allowance for all additional time to which the Contractor would have been entitled under its terms. A very considerable proportion of the expense incurred in rushing the work at the end so as to comply with the dates fixed in the supplemental contract may therefore properly be charged to the Contractor in the settlement of this claim.

In a letter from Mr. Jewel to the McClintic-Marshall Construction Co., dated August 19, 1911, attached to the Contractor's brief, we find this statement:

We are still receiving upstream sheathing plates uncurved. I may have neglected calling attention to this point sooner, but was under the impression from some source that you were curving all the end sheathing plates in the shop after the first leaves. These plates coming here straight is one of our worst sources of delay and expense, and at least the heavy plates, i. e., over the air chamber, should be curved at the shop before shipping.

On September 5, 1911, Mr. Jewel wrote the following letter to the Contractor (see Contractor's brief):

Four pintle castings were shipped on April 8 and checked against leaves Nos. 37 to 40. These have been received and used as assigned.

Four were shipped on June 16 and checked against leaves Nos. 33 to 36, inclusive. These have been received and used in leaves Nos. 50 to 53.

Six were shipped on July 20 and checked against leaves Nos. 50 and 51 and 29 to 32, inclusive. These should have been on steamship *Santona* now at dock, but by some means missed the boat. We need them badly, as the bottom girders for C 4847 ought to be fitted with castings now, and unless they are so fitted we will lose ten days to two weeks on erection when we start.

We have enough reaction castings to last for months. Please get this business lined up so we will not be delayed in future for castings.

Operations on the Pacific division are practically at a standstill for want of material—principally water-tight frames and one water-tight diaphragm, W B 6 R. We may find these on the *Santona*, as some material is still to come off, but even if we do it looks bad at this late day to be holding up work for our own structural material. That over 10,000 tons is on the Isthmus doesn't make it look any better.

It is impossible, on account of the distance from the shop, to check material ahead and keep you lined up. We can simply depend upon you to get out and ship as required, because probably 3,000 tons is always en route.

Mixing material for both divisions in the same cargo has already cost us several thousand dollars, and in spite of protests and promises, the shipping memorandums for both keep coming merrily on. Unless you have arranged to separate it at Baltimore it will cost us several thousand more.

In a letter to Mr. Jewel of September 15, 1911, attached to the brief of the Contractor, it is stated:

We inclose herewith copy of letter from Maj. F. C. Boggs, dated September 8, and copy of our reply to the same, both of which need no comment. It seems that we are falling very far behind on the erection, and we will be obliged to push this work from now on in the field with all possible dispatch.

We realize that you have been delayed on account of the Wheeling Mold & Foundry Co. material and water-tight frames, which, as you know is largely due to the delay by the Government in furnishing us full and complete information, and the delays in securing the approval of the details at the start.

It is up to us, however, to make up this lost time, and we trust that you will get your end of the work going in good shape without further delay.



In a letter of January 29, 1912, from Mr. Jewel to Mr. Henry Goldmark, attached to brief of the Contractor, it is stated:

Replying to your letter of January 25, in regard to painting the inside of leaves, beg to advise that this matter will have our careful and prompt attention. It is a pity that this steel must stand so long before being able to put the leaves through a preliminary test and give them a final coat of paint. We as yet do not know how long it will be before satisfactory manhole covers can be secured for the water-tight diaphragms, but will watch the insides of these particular leaves and have them cleaned and repainted where any extensive corrosion promises to start.

In this letter, as in other letters attached to the brief of the Contractor, frequent reference is made to the fact that the work was being delayed by the nonreceipt of the manhole covers with the gaskets so that they could be installed. These letters indicate that there were also many delays for which the contractor was responsible and which caused increased expense, independently of any delays that were caused by the action of the Isthmian Canal Commission. As heretofore pointed out it was not possible under the terms of the original contract to set off the delays due to the fault of the Contractor against the delays caused by the Isthmian Canal Commission in the allowance of additional time when making the supplemental contract, and as such delays were undoubtedly the proximate cause of a considerable proportion of the rush work and increased expense in conforming to the dates fixed in the supplemental contract, it is but fair, just, and equitable to charge against the contractor such reasonable proportion of the claimed extra expense for rush work at Miraflores as will result in his bearing a just proportion of the extra expenses due to causes not taken into consideration in the making of the supplemental contract?

As heretofore shown, there were delays caused by the Isthmian Canal Commission in the change of the specifications relative to the size of the subpunched and subdrilled holes, and also delays due to the excessive amount of grinding and also to the excessive amount of cleaning, to the water in the locks, and to conditions of the yards subsequent to the making of the supplemental agreement, which resulted in increased expenditures in order to complete the gates within the time specified in this agreement.

For further reference to the evidence, see contractor's brief, pages 141 to 147, inclusive.

In determining the cost at which the work should have been done at Miraflores under the conditions as they existed, the claim of the Contractor, exclusive of rush work, has been reduced by 57.68 per cent, or to \$73,195. The items constituting the \$73,195 to be deducted as excess at Miraflores, heretofore considered and allowed, are as shown in the table below:

	Amount to be deducted.	Page reference of report.
Condition of yards and tracks.....	\$5,226.00	292
Water in locks.....	5,000.00	292 to 306
Bolting up.....	26,184.20	306 to 323
Reaming.....	4,785.00	323 to 328
Riveting.....	12,000.00	329 to 367
Grinding.....	14,000.00	367 to 403
Cleaning.....	6,000.00	405 to 430
	73,195.20	

The same reduction in the amount claimed for rush work would leave \$60,092 to be deducted for rush work in arriving at the cost at Miraflores which the Contractor should bear. On this basis the total excess to be deducted would be \$73,195 plus \$60,092, or \$133,287. The total expense at Miraflores was \$911,259. This minus the excess would leave \$777,972 as the cost that should be borne by the Contractor at Miraflores. This divided by 17,752 tons would give \$43.824 as the cost per ton that should be charged to the Contractor at Miraflores. It is believed that this division of the excess claimed by the Contractor on page 75 of his claim, when applied to Gatun and Pedro Miguel, would result in a fair, equitable, and just distribution of the excess cost between the Contractor and the Isthmian Canal Commission.

On this basis, when worked out as shown in the Contractor's claim, the cost per ton at each lock to be charged to the Contractor would be as follows:

	Per ton.
Miraflores .....	\$43.824
Pedro Miguel, \$43.824 plus 10 per cent, or.....	48.206
Gatun, \$43.824 plus 10 per cent, or.....	48.206

The excess per ton would be:

Miraflores, \$51.332—\$43.824 .....	\$7.51
Pedro Miguel, \$59.366—\$48.206.....	11.16
Gatun, \$53.870—\$48.206.....	5.66

Applying this cost per ton as the excess chargeable to the Commission, the amounts would be as follows:

Gatun, 25,498 tons, at \$5.66 per ton.....	\$144,318
Pedro Miguel, 14,924 tons, at \$11.16 per ton.....	166,551
Miraflores, 17,752 tons, at \$7.51 per ton.....	133,317
Total.....	444,186

To the above sum should be added the proportion of transportation, liability, and general expense arrived at as shown on page 85 of the claim, as follows:

$\frac{391,891 \times 444,186}{3,170,007} =$ .....	54,912
Total.....	499,098

It is recommended that \$499,098 be allowed on claim 6.

*Claim 7.—Extra cost of erection outfit.*

On page 67 of the Contractor's claim he states this claim as follows:

7. Extra cost of erection outfit required to complete the work within the time demanded, \$200,000.

On page 86 of his claim the Contractor gives the way in which he seeks to establish the validity of this claim, as follows:

The total cost of equipment and tools for this work, less the salvage, was about \$400,000. As closely as we can figure nearly twice as much equipment and more than twice the number of small tools, bolts, and washers were used than would have been required had it been possible to carry on the erection without resorting to the rush work necessary to complete the work on time to suit the Commission's requirements. The cost chargeable to the Commission is one-half of \$400,000, or \$200,000.



An examination of the books of the Contractor shows the cost of all the field orders for Panama equipment and the credits allowed by the Contractor for equipment returned and sold, as follows (see vol. 27) :

Field order.	Description.	Amount.
78	Compressors, motors, etc.....	\$9,525.78
79-1	Steel falsework, scaffolding, and bridges.....	30,813.16
79-2	.....do.....	30,224.88
79-3	.....do.....	6,650.97
79-4	.....do.....	10,389.48
80	Heavy locomotive cranes.....	19,266.07
81	Horizontal reamers.....	23,449.84
82	Pneumatic tools.....	93,269.36
83	Electric fittings.....	31,412.47
87	All tools, equipment, and supplies not included in other field orders.....	156,379.27
88	Field bolts for lock gates.....	71,481.09
89	High-speed steel tools for reaming and drilling.....	3,449.82
92	2 electric tool driven grinders.....	4,239.37
94	Rivet heating plant.....	2,000.87
97	1 bottom section for crane No. 18.....	271.35
102	One 50-ton locomotive crane No. 20.....	10,767.72
104	24-inch Schumacher-Boyle lathe and 5 horsepower motor.....	1,420.57
105	32 chain blocks, 8 tons capacity.....	5,466.67
106	Two 3,000-gallon tanks.....	215.00
107	2 "A" frame derricks for erection of C-5269.....	191.06
108	2 erection bridges.....	7,144.42
108-A	.....do.....	14,094.05
109	Additional small tools.....	5,315.45
111	One 50-ton locomotive crane No. 21.....	10,500.00
113	2 erection bridges.....	6,960.72
115	4 duplex, 2-stage compressors, four 100-horsepower motors, 4 vertical air receivers, and 4 bolts.....	9,332.17
118	2 national No. 1 bolt cutters, direct-motive drive.....	949.26
119	Erection tools, contracts 5461, 5463, 5467.....	250.19
126	Two 100-horsepower motors, 2 air compressors, 2 air reamers, and 2 belts.....	3,933.12
127	Rivet and bolt making machines, etc.....	4,630.63
128	3 Ingersoll-Rand compressors, 3 air reamers, three 100-horsepower motors, and 3 belts.....	7,360.61
129	Additional pneumatic tools.....	21,532.55
130	Additional electric supplies.....	5,906.22
131	Additional miscellaneous tools.....	50,169.02
132	1 Ingersoll-Rand compressor.....	2,347.11
Total credits for equipment returned.....		662,120.32
		237,674.55
		424,445.77

The difference between this amount and amount shown on our statement of cost is due to equipment disposed of after that statement was made up.

The credit for equipment returned is represented by the amount received by us from the sale of part of the equipment and the value to us for the equipment which we could use in our erection department in the States. Any equipment which could not be disposed of or used by us was considered of no value.

This statement was prepared by the auditor of the McClintic-Marshall Construction Co., Mr. E. J. Patterson. Mr. Patterson made the following affidavit as to the correctness of this and other data that he furnished:

RANKIN, PA., May 1, 1915.

I, E. J. Patterson, do solemnly swear that in the examination of the books of the McClintic-Marshall Construction Co. in the claim of the said company under the act of June 24, 1914, made by B. H. Harrah, a member of the Commission to investigate said claim, that the data furnished is taken from the original entries in the books of said company, and that the statements made by me in connection with such data are true to the best of my knowledge and belief, so help me God.

E. J. PATTERSON.

Subscribed and sworn to before me this 1st day of May, A. D. 1915.

B. F. HARRAH,

Assistant Auditor for the Panama Canal  
and Member of Commission to Investigate the Claims  
of the McClintic-Marshall Construction Co.

In a letter of December 29, 1914, calling upon the McClintic-Marshall Construction Co. to furnish a statement of the total expenditures under the contract, the following specific request was made relative to the equipment:

8. If an inventory was taken as to equipment on hand at the beginning of the work on the lock-gate contract and to be used in connection with such contract, you should furnish a statement showing the value of the equipment as taken upon such inventory. If new equipment was purchased subsequent to the taking of this inventory, the amount and character of it should be shown. If an inventory was taken as to the equipment on hand at the completion of the lock-gate contract and the value of such equipment estimated, you should furnish copy of such inventory.

Reply by the Contractor was made to this letter and this specific request March 26, 1915. (See Exhibit No. 26, vol. 26 of the evidence.) In this letter the Contractor stated, in relation to the request made in paragraph 8 above quoted, that:

Your request No. 8 we will be unable to furnish, as to inventory was kept.

The evidence establishes the fact that the total expenditures for equipment was \$662,120.32 and that the Contractor has credited this account with \$237,674.55, leaving as the actual expenditures claimed to have been made for equipment \$424,445.77. The credits shown represent the proceeds of such equipment as was sold and the value the Contractor placed on the equipment that was returned. As the Contractor was unable to furnish any inventory of the equipment, it was impossible to accurately verify the correctness of the credits to this account, although it did appear that the credits in the account were made in the usual course of business and in the usual way in which the Contractor made such credits in other cases in his book-keeping system.

The estimate of Mr. S. P. Mitchell for equipment was as follows (see p. 263 of this report):

Erection materials (including erection bridges, bolts, and other items of material not included in plant)-----	\$160,000
Use and depreciation of erection plant-----	147,000

It will be noted that the total of these two items is \$307,000.

(For original estimates see vol. 33 of the testimony.)

Mr. Mitchell also puts in an item of \$300,000 to cover contingencies. Of course, this item of contingencies would apply and would be used to take care of any extra or excessive expenditures and would not necessarily be applied wholly to make up unforeseen losses on equipment. If the Contractor should be allowed the same percentage on this claim that has been allowed on the claim for labor, the excess for which the Commission should assume responsibility would be about \$85,000. If an allowance of \$85,000 should be made to the Contractor for excess equipment purchased in complying with the contract and the equipment account credited with this sum, it would show the cost of equipment chargeable to the Contractor to be \$339,445.77. This is but \$32,445 in excess of the amount estimated to be necessary by Mr. S. P. Mitchell. The Contractor's estimate for erection expenses that would come under the head of equipment was but \$164,000. (See original estimate of the Contractor, vol. 11, Exhibit No. 1.) This was clearly inadequate.

It is believed that an allowance of \$75,000 on the item of equipment, in view of the uncertainty as to the value of the equipment



that was returned after the work was completed and in view of the fact that no inventory was kept and that no better check can be made of this account than as heretofore shown, is all that would be justified in the present state of the record. In making this allowance your committee realizes that the excessive demands that were made upon the Contractor in connection with the grinding, the difficulties in riveting, and the bolting up of the small holes, and the necessity for completing the work rapidly, which in part resulted from the action of the Isthmian Canal Commission, all tended to very materially affect expenditures for equipment. It is not believed, however, that the action of the Isthmian Canal Commission in connection with the performance of this contract resulted in expenditures for equipment in excess of those that should be borne by the Contractor of more than \$75,000, as heretofore found.

An allowance of \$75,000 is recommended on claim 7.

This concludes the examination of all the claims, except such part of claim 3 as should be allowed for the weight of excess rivets cut out. (See p. 216 of this report for statement of claim.)

The estimate of cut-outs made at Miraflores was 165,772. This is about 44 per cent of the total number of cut-outs that the Contractor claims. This percentage of reduction in the number of cut-outs claimed at Gatun and Pedro Miguel and the number increased by about 30 per cent to cover the difference between the conditions as they existed at Miraflores and the other two lock sites would show the number of cut-outs to be between 1,000,000 and 1,200,000. The Contractor admits that 6 per cent of all cut-outs should be charged to him. In settling the claim it has been found that he should be charged with three-eighths of the excess cost of riveting by reason of the fact that he failed to make any claim under the terms and conditions of the contract, and placed it beyond the power of the Commission, by reason of the failure to make such claim, to in any way minimize the loss which he now claims was suffered by reason of the excess cut-outs.

Applying these factors in making a reasonable estimate, which is the best that can be done with this particular claim, it is thought that the Commission should assume the responsibility for 300,000 pounds in weight of the rivets cut out. The price fixed for the material, less its scrap value, is \$35 per ton. (See p. 247 of this report.) The allowance for the value of rivet material as here found will be made as a part of claim 3, and the exact figure will be found on page 247 of this report.

On page 47 of the Contractor's claim he states that—

The Contractor's crane No. 18, about July 3, 1911, was completely wrecked by a gravel train operated by the Commission. The crane was repaired by the Commission at the Gorgona shops, but the Contractor lost the use of it for 98 days, delaying the Contractor's work. For this time of 98 days the Contractor rendered the Commission a bill for \$1,960. The bill was not paid. The use of the crane for the 98 days it was being repaired was worth far more to the Contractor than the amount of the bill.

The facts as stated by the Contractor in relation to this claim are substantially correct. The Contractor did render a bill for the use of the crane, but this bill was not paid. It is doubtful, however, whether his claim is one that comes within the meaning of the act of Congress, June 24, 1914, authorizing an investigation of the claims

of the McClintic-Marshall Construction Co. The crane was wrecked at Miraflores on July 3, 1911, and subsequently repaired by the Commission at Gorgona Shops, the repairs being completed October 28, 1911. The bill is for the use of such crane for 98 days at \$20 per day. Mr. Williamson states that he thinks this amount is excessive. (See letter of Nov. 10, 1911, file 84-C-81.) Mr. Jewel, however, states that he had paid without question on his work for the use of Commission cranes of the same class at the rate of \$80 per day. Crane service was an important item in the construction of the lock gates, and it is believed that \$20 a day was not an unreasonable demand to make for the loss of the use of this crane.

It is recommended that the claim be allowed.

On page 86 of the Contractor's claim we find this statement:

N. B.—An additional claim covering interest charges on account of deferred payments will be presented in detail as soon as it can be compiled.

This claim was presented by the Contractor under date of October 4, 1915.

It has never been the policy of the Government of the United States to pay interest on claims against it. It is presumed that the Government pays proper claims against it promptly when the proper evidence is submitted to substantiate such claims, and all parties entering into contracts with the Government do so with the knowledge of this public policy on the part of the Government. Claims for interest are universally disallowed, except in cases where there is an express provision in the contract to pay interest, or except in cases where Congress has specifically authorized the payment of interest. In the absence of a specific provision in the act of June 24, 1914, authorizing the payment of interest it is not believed that Congress intended that such a claim should be entertained by virtue of the authority therein conferred.

No recommendation is therefore made upon the claim for interest.

The specific claims made by the Contractor and the action recommended by your committee thereon are shown in the following summary:

	Amount claimed.	Amount allowed.	Difference.
Claim 1, extra cost of drawings.....	\$8,890.00	\$5,580.00	\$3,310.00
Claim 2, increased cost of fabrication.....	320,892.00	77,264.64	243,627.36
Claim 3, rejected material.....	48,621.00	10,500.00	38,121.00
Claim 4, extra cost of water stops.....	21,999.75	21,094.75	905.00
Claim 5, loss of shop output.....	123,660.00	23,510.00	100,150.00
Claim 6, extra cost of erection.....	1,218,475.00	499,098.00	719,377.00
Claim 7, extra cost of erection outfit.....	200,000.00	75,000.00	125,000.00
Total.....	1,942,537.75	712,047.39	1,230,490.36

The following table indicates the probable loss suffered by the Contractor:

Total payments.....	\$5,676,162.96
Total actual and estimated expenditures.....	8,481,222.00
Total apparent loss to Contractor.....	2,805,059.04



The table below shows the Contractor's apparent loss under his estimate, including profits:

Total Contractor's estimate-----	\$5, 678, 457
Total cost, Contractor's estimate-----	8, 481, 222
Total loss, Contractor's estimate -----	2, 802, 765

The table below shows the total of the Contractor's apparent loss, original claim, and difference not included in the original claim:

Total apparent loss-----	\$2, 802, 765. 00
Original claim-----	2, 047, 267. 75
Difference not included in claim-----	755, 497. 25

The total amount of the revised claim is \$1,942,537.75. The amount recommended for payment in this report is \$712,047.39. The amount of the Contractor's revised claim not allowed is \$1,230.-490.36. The difference not claimed in revised claim, based on actual payments and Contractor's actual and estimated expenditures, is \$862,521.29.

Under this settlement, the apparent loss which seems to be properly and rightly chargeable to the Contractor is \$2,093,011.65, or the difference between the total apparent loss to Contractor, \$2,805.-659.04 (difference between total payments and total actual and estimated expenditures), and the total amount allowed in this report, \$712,047.39. Such loss, however, will be further reduced by the amount heretofore allowed for the use of the crane, but not included in the statement above.

As far as your committee can determine from the evidence this part of the loss sustained by the Contractor was due to his low bid, his inexperience in the character of the work undertaken, the unusual conditions under which the work was required to be performed, and bad management in connection with the fulfillment of the contract.

The remainder of the loss to the Contractor, it is believed, resulted from his being required to do higher class work at more expense than was reasonably contemplated under the specifications, and also such loss as was occasioned by excessive demands of the Commission's engineers and inspectors which did not benefit the work to any appreciable extent.

There are two classes of losses which the Contractor has sustained in this case. First is the loss to the Contractor due to performing work which benefited the gates: the other is the loss to the Contractor which was of no benefit to the work.

In Mr. Goldmark's opinion he got as good riveting as could be—as good as he ever got. (See vol. 8, p. 194, of his testimony.) He shows (vol. 7, p. 145 of Wolfel's testimony) that the first gates were better than he thought they would be when tested.

On page 197 of his testimony, volume 8, Mr. Goldmark states:

I think we got the best gates in the world. I think the workmanship could not be improved upon.

After discussing the question to some extent and stating what was done, Mr. Goldmark made this statement (see p. 199, vol. 8):

I will say I think we went about as far as we could go under the contract in what we asked.

He did state before that, however, that he did not think that he was going beyond what could be asked reasonably under the contract.

The specifications contained very few limitations, and it was largely a question of individual judgment all through the work as to what should be considered first-class workmanship. It is believed by your committee that the work was first-class and that in the final result the Isthmian Canal Commission got better work than it was entitled to under the specifications, as drawn, and that it in part received a benefit for the allowance recommended herein.

To the extent to which the Commission received better work under the contract than it was entitled to, the Contractor has an equitable claim for the value of such work. To the extent to which the Contractor suffered loss by reason of the excessive demands and interference with the work by the Isthmian Canal Commission's inspectors and engineers, it has an equitable claim under the act of June 24, 1914. It is believed that the equity between the Contractor and the Government will be properly adjusted by a total payment equal to the sum of the amounts recommended in this report on specific claims, as follows:

Classified claims 1 to 7 inclusive (seven hundred twelve thousand forty-seven dollars and thirty-nine cents)-----	\$712, 047. 39
Claim for loss of use of crane while being repaired, 98 days at \$20 per day (one thousand nine hundred sixty dollars)-----	1, 960, 00
Total payment recommended-----	714, 007. 39

Respectfully submitted.

H. H. ROUSSEAU,  
*Chairman of Committee,  
Engineer of Terminal Construction.*

H. A. A. SMITH,  
*Member of Committee,  
Auditor.*

B. F. HARRAH,  
*Member of Committee,  
Special Counsel and Examiner of Claims.*

The above report in detail, findings, and recommendations are approved.

GEO. W. GOETHALS,  
*Major General (formerly Colonel),  
Governor, the Panama Canal.*



















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